JOURNAL *of* EDUCATIONAL RESEARCH

Volume XIII MAY, 1926 Number 5

THE INFLUENCE OF CERTAIN SOCIAL FACTORS UPON SCORES IN THE STANFORD ACHIEVEMENT TESTS

S. A. COURTIS
University of Michigan

One of the purposes for which schools exist is to develop certain scholastic abilities in children. In the judgment of school men ability in reading, arithmetic, spelling, etc., is measured, in part at least, by the Stanford Achievement Test. At any rate, superintendents, supervisors, and teachers buy each year many thousands of these tests, give them to the children under their charge, and report the results as evidence of the success or failure of their teaching efforts.

The standard score of the low third grade in the Stanford tests given in June is 20 points;[1] that of the high eighth grade is 75 points, a difference of 55 points. Within any one grade the range of individual scores is very large. For instance, for a group of eighty-nine boys and girls in the high sixth grade in three Detroit schools tested in June the lowest score made was 27 points and the highest, 78, a range of 51 points. That is, in a single grade, the individual scores may vary through 90 percent of the total change in average score from the low third to the high eighth grade.

The question immediately arises, "How shall this great range of ability within a single grade be explained?" Some persons consider that "poor teaching" is sufficient explanation; others,

[1] *Manual of Directions* (Revised) Yonkers, New York, World Book Company. 1926. p. 45.

"poor administration"; still others, "individual differences" in intelligence, home conditions, or social status. The investigation reported in this paper is one of a series of studies[2] having as their aim the discovery of the factors which condition a child's success in school. The immediate purpose of this article is to present measures of the *distinctive* influence of environmental factors. More specifically, it deals with measurement of the effect of attendance at Sunday school upon the scores in Stanford tests made by children from homes professing church membership.

To prevent misunderstandings it may be well to emphasize the word *distinctive*. The famous controversy as to whether it is "nature or nurture" which is to be credited with the abilities developed by school training seems to the writer to be a foolish one. He believes that there is a single developmental process, life; not two separate entities, nature and nurture. Each and every result has a "nature" aspect and a "nurture" aspect. When either factor is regarded as constant, resulting differences may be properly ascribed to the other. Thus, when two boys are given identically the same nurture, yet develop differences in ability, those differences will be considered to be indicative of, or caused by, differences in heredity. Conversely, when boys of proved equal heredity develop differences in ability under unequal nurture, the differences will be considered to be due to the differences in nurture, but in every case the product is actually due to the combined action of both nature and nurture. To think of either one as contributing independently of the other is to violate a fundamental truth. Both nature and nurture determine the characteristics of the germ plasm; both nature and nurture determine the effect of school training. The two factors can never be dealt with out of relation to each other any more than matter can be dealt with apart from energy. To have any nature at all there must be some nurture and vice versa. Yet the relative degree to which each is represented in a given type of product changes from situation to situation. Hence the importance of

[2] Made possible by a grant from the Commonwealth Fund.

determining the effect of larger or smaller amounts of either factor; hence, also, the danger that in the discussion of such measurements, statements will be made which seem to indicate that the writer believes in these factors as separate entities. Such a belief on the part of the writer is explicitly denied.

The problem of accounting for individual differences in achievement has both general and specific aspects. From the general point of view the fact of uniformity of range in individual scores from city to city has not received the attention it deserves. For instance, the scores of approximately two thousand eighth-grade children in addition, collected independently from two neighboring states are almost identical in range and frequency for both the number of examples attempted and the percent of accuracy. (Table I and Figure 1). For 96 percent of the children it would be immaterial, as far as ability to add at graduation is concerned, whether they had attended school in one state or the other. Thus our unstandardized and extremely variable state school systems nevertheless graduate approximately constant percents of children making each type of score.

If, however, we compare the distribution of scores from one of these states with a corresponding distribution from a large eastern city which has long been noted for its general culture and high educational ideals, marked differences are observed. It is not known whether these differences are caused by superior training or by better stock, or by both, but even if they are credited wholly to nurture, 60 percent of the children are found to have the same scores for examples attempted and 85 percent for accuracy. Neither rate nor accuracy scores are true measures of ability; the truth is probably somewhere between the two results, say 75 percent. In other words, even if the entire difference between the city and state results is credited to nurture, still three out of four children make the same scores under widely different environmental conditions.

Such evidence, and it exists in large amount, proves two things: (1) that intelligent effort given to improving nurture does improve the educational product, but (2) that the distinctive

TABLE I. CONSTANCY IN EDUCATIONAL RESULTS

A

Number of Examples	Percent of Examples Attempted				
	Iowa (2,243 cases)	Kansas (1,618 cases)	Common to Both	Eastern City (3,092 cases)	Common to City and Kansas
(1)	(2)	(3)	(4)	(5)	(6)
4	1	1	1	.....	.....
5	4	2	2	1	1
6	8	8	8	2	2
7	11	11	11	3	3
8	16	16	16	6	6
9	14	13	13	7	7
10	12	15	12	9	9
11	9	11	9	9	9
12	8	8	8	10	8
13	5	5	5	8	5
14	4	4	4	10	4
15	2	2	2	8	2
16	2	1	1	8	1
17	1	1	1	4	1
18	1	1	1	3	1
19	1	1	1	3	1
20	1	.....	.....	9	.....
Total	100	100	95	100	60
Mean	10.0	10.2	.....	13.6	.....

B

Percent Correct	Percent of Accuracy				
	Iowa (2,243 cases)	Kansas (1,618 cases)	Common to Both	Eastern City (3,092 cases)	Common to City and Kansas
0–49	19	20	19	9	9
50–	13	14	13	12	12
60–	15	14	14	14	14
70–	17	17	17	19	17
80–	18	17	17	24	17
90–	8	8	8	14	8
100–	10	10	10	8	8
Total	100	100	98	100	85
Mean	68	67	.....	74	.....

Comparison of range and frequency of scores of eighth-grade boys and girls in two western states and one eastern city. Ability, Addition Courtis Series B, Test 1. Frequencies expressed as percents of total number of cases.

effect of such environmental improvements, over and above the effect of such general nurture as is common in the schools of

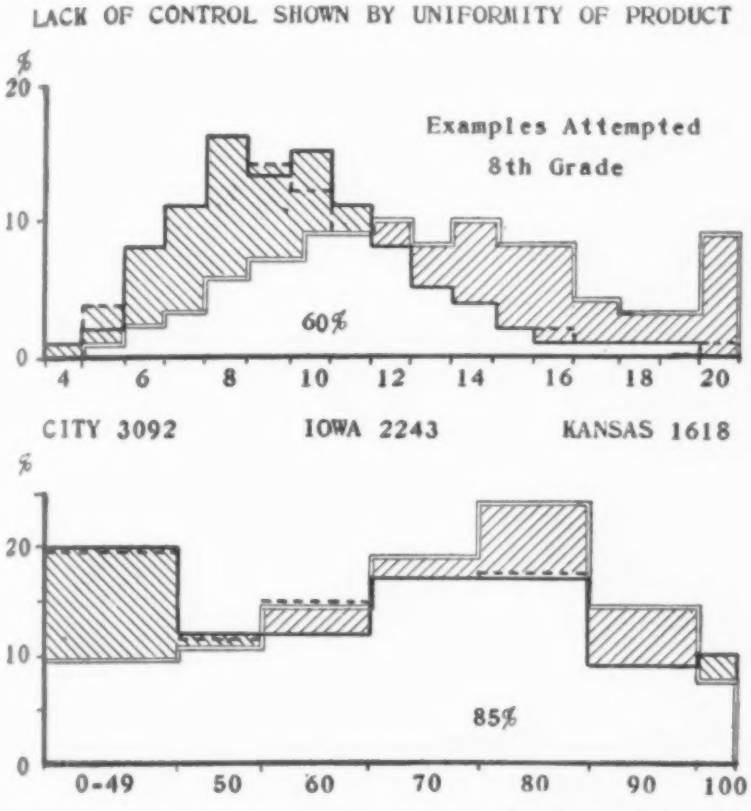

FIGURE 1. OVERLAPPING OF DISTRIBUTIONS

Upper diagram: Examples attempted in Courtis Series B, Test 1, Addition. Solid line Kansas; broken line Iowa; double line Eastern city; part unshaded, percent of children common to state and city.

Lower diagram: Accuracy of addition. The differences in environmental conditions between the western state and the eastern city do not affect the distributional score in more than three cases out of four.

our northern states, is very much smaller than most people believe. It should go without saying that to the degree there was no nurture at all, there would be no development of ability. If,

TABLE II. ABILITY IN LIST SPELLING AND NUMBER OF YEARS IN CITY

Accuracy of Spelling	Number of Seventh Grade Children Making Each Accuracy Score Grouped According to Years Spent in City Schools											Total Frequency
	1	2	3	4	5	6	7	8	9	10	X	
100%	2	1	1	3	1	1	--	--	--	--	2	11
95	4	2	--	--	5	2	--	1	--	--	1	15
90	3	1	4	3	2	4	1	1	--	--	1	20
85	5	1	1	2	4	1	4	1	--	--	3	22
80	2	1	--	2	3	4	1	--	--	--	2	15 — S
75	--	1	4	2	3	2	3	--	--	--	1	16
70	3	1	2	1	7	5	2	--	--	--	--	21
65	1	2	2	1	2	2	--	--	1	--	1	12
60	2	2	1	1	1	8	2	3	--	--	2	22
55	2	3	1	4	--	4	4	1	--	--	1	20
50	1	1	4	2	1	2	1	--	--	--	1	13
45	1	3	--	--	1	--	--	--	--	--	1	6
40	1	2	4	3	2	2	3	--	--	--	2	19
35	1	1	2	2	2	2	1	--	1	--	--	12
30	--	1	3	--	--	1	--	--	--	--	3	8
25	3	1	2	2	--	2	--	1	--	--	--	11
20	--	1	--	2	--	--	2	--	--	--	2	7
15	--	--	--	--	--	--	2	--	--	--	--	2
10	--	1	--	1	--	--	1	--	--	--	3	6
5	--	--	1	--	--	--	--	--	--	--	--	1
0	--	--	--	--	--	--	1	--	--	--	--	1
Total	31	26	32	31	34	42	28	8	2	--	26	260
Average	70.5	57.3	56.4	59.8	73.1	64.6	53.6	66.2	50.0	--	55.8	61.9

however, there are schools which conform to the average American schools in type of opportunity offered, and in the amount of training provided, then the distinctive differences caused by differences in texts, courses of study, ability of teachers, as well as by differences in social status, environment, etc., are relatively insignificant in magnitude. *This does not mean at all that they are insignificant in value.* Even small differences may be critically significant for progress. However, the fact of large, general, natural effects and small, distinctive effects from effort serves to emphasize the important truth that we have not yet learned what the nature of education really is, and hence are not able to control the outcomes of educational effort.

More direct evidence supporting this conclusion is presented by an analysis of the scores in spelling made by children in a certain city. At the time the survey was conducted the city had been organized but ten years. The scores of the children were divided into groups according to the number of years spent in the city. (Table II). Among the thirty-one children who had moved to the city during the year previous to the survey (for whose ability, or lack of it, the city schools can in no way be held responsible) there were nine children whose accuracy of spelling was 90 percent or higher and four children whose accuracy of spelling was 40 percent or lower. Similarly in each group but one (column 9) children are found to be "good" spellers and "poor" spellers. The line of means (and other evidence collected during the survey) shows that on the average the general efficiency of the teaching of spelling in the city was about two years below that of the average American school. Whatever may be the explanation for this state of affairs, it should be apparent that because of the uniformity with which every type of individual result, from good to poor, is reproduced under widely varying social conditions, it is not probable that differences in social factors alone can properly be charged with responsibility for much of the variation. A previous study has isolated the major factors which determine a child's score and has shown the relation between them. The factors—which

Average	70.5	57.3	56.4	59.8	73.1	64.6	53.6	66.2	50.0	--	55.8	61.9

prove to be three in number—have been called heredity, maturity, and training.[3] They are regarded as measured by intelligence tests, age, and semesters in school. Each needs explanation.

Scores in intelligence tests reflect significant differences in children; whether or not the tests are validly named "intelligence" tests has nothing to do with their use in this investigation. They are called measures of heredity because they are believed to reveal individual differences not produced directly by school training. When the environment presents opportunities for experiences in excess of matured capacity (as is most certainly the case for the average child) the products of training will be proportional to the inborn or inherited capacities of the children by definition. Scores in the so-called intelligence tests do reflect the results of such development and hence measure roughly individual variation in native capacity.

Chronological age (in months) is a gross measure of maturation. A child is a developing organism. Day by day he changes in size, in substance, in experience, in many, many ways. A child who has lived just 120 months is less developed than he will be when he has lived 150 months. Differences in age thus reflect individual differences in maturity.

The measurement of schooling is a more complex matter. Consider three children who begin the first grade at a given age but who, during twelve half-years, progress at different rates so that at the time of a test one is in the third grade, one in the sixth, and one in the ninth. Each child has been in school an equal number of days, but each has had very different experiences. Shall their training be measured by grade attained or by semesters in school? Such evidence as is available tends to show that every school situation offers opportunities far in excess of matured capacity so that in reality opportunity should be measured by the capacity to which it is offered and not by the potentialities of the situation. Under such conditions each of the three

[3] For definition and an extended discussion of these factors see *Why Children Succeed*, S. A. Courtis, Chapter IV, pp. 37-50. (Detroit, Michigan, Friesema Brothers Press, 1925)

children must be considered to have had twelve units of schooling. This assumption becomes absurd when carried to the extreme, but is probably valid under ordinary school conditions. Accordingly for present purposes, training was measured by "semesters spent in school" and not by "grade attained."

Perhaps it is well to add that all of the measures used in this study are gross measures. Scores in Stanford tests are subject, on the average, to an error caused by the play of chance factors of 5.4 percent;[4] scores in intelligence tests are similarly variable; ages reported by children and parents are sometimes falsified and often incorrect when checked against birth records; school records of entrance and progress are also subject to human errors of observation, record, and computation. So far as effort and care are effective, such errors have been reduced to a minimum. Two intelligence tests were used, the National intelligence tests and the Detroit revision of the Army intelligence test. Records of age and training were carefully checked.

For 443 Stanford scores of boys and girls between the ages of 10 and 13.5, the correlations of heredity, maturity, and training separately with Stanford scores were as follows: Stanford with National 0.78 ± 0.01, with Army 0.81 ± 0.01, with Age 0.21 ± 0.03, with semesters in school 0.33 ± 0.03. The higher correlation of Stanford with intelligence than with the other two factors is due to the fact that intelligence scores are themselves indirectly the product of experience as well as of differences in heredity. What the correlation between Stanford and heredity alone would be is not known. The correlation between Stanford Achievement scores and Stanford Binet individual intelligence quotients for 73 cases was 0.31 ± 0.07.

The problem with which this article is concerned makes it necessary to determine the combined contribution of the three factors in order to see how much is left to be allocated to the

[4] See Courtis, *op. cit.*, p. 100.
An error of 5.4 percent on a score of 50 amounts to 2.8 points. As this is an actual error based on the scores of only 78 boys and girls tested with form B and two days later with form A, it compared favorably with the probable error of 1.9 points reported by the authors of the test, based on more than twice as many children, and corrected for regression effects.

influence of home, church, and society. The answer is given by the regression equation,[5]

$$\text{Stanford score} = 0.055\ \text{Age} + 0.184\ \text{National} + 0.40\ \text{Detroit} + 0.57\ \text{Training} - 4.3$$

This equation has a standard error of estimate of 6.0 points. This is 10.8 percent of the mean score of the group, 55.7, and corresponds to a multiple correlation coefficient of 0.90.

For instance, if the information is given that a child is 137 months old, that his score in the National Intelligence test is 78 and in the Detroit Army test 43, and that he has spent 11 semesters in school, his Stanford score may be estimated as follows:

$$\begin{aligned} \text{Score} &= 0.055\,(137) + 0.184\,(78) + 0.4\,(43) + 0.57\,(11) - 4.3 \\ &= \quad 7.5 \quad + \quad 14.4 \quad + \quad 17.2 \quad + \quad 6.3 \quad - 4.3 \\ &= \quad 41.1 \end{aligned}$$

In this case the actual Stanford score made by the child was 41.3. The error, 41.1 — 41.3, or — 0.2, was thus 0.5 percent of the actual score.

For this child the agreement of predicted and actual scores

---

[5] Based on girls' scores. The formula for boys is slightly different in the value of the constants but the differences are caused by the differences in the average scores of boys and girls and are not significant.

For readers unfamiliar with regression equations it may be well to explain that the formula above is not a representation of a natural law, like the formula for the law of gravitation, but merely an expression, based on statistical methods and assumptions, which tells by what numbers to multiply the various scores to make the sum of the products equal to the Stanford score with the least error. In the absence of true knowledge of causal relationship, it serves as a suggestive means of prediction.

It is probable that the true law when discovered will be represented by a formula similar to

$$\text{Stanford} = kH^{M^T}$$

in which k = a constant, H = a measure of the hereditary differences in individuals, M = rate of maturation, and T = time. The regression formula is used in this study merely as an illustration both of how reliably prediction may be made even with our present imperfect tools and of how prediction may some day be made in terms of law. The formula has no permanent value and does not represent real relationships. All conclusions based on it are subject to modification when the true relationships between factors are discovered. The values of the constants change with each selection of factors and scores. The important fact revealed by this study is not law, but the clear indication that law is operative in the situation; that educational results need to be studied analytically in this fashion; and that when so studied the educational process proves to be under much less control than is commonly believed.

is very close. In the case of some children, however, predicted scores vary widely from actual scores. For instance, the age of another child was 131 months, his National score 99, his Detroit score 30, his semesters of training 10. Substitution in the formula gave

$$\begin{aligned} \text{Score} &= 0.055\,(131) + 0.184\,(99) + 0.4\,(30) + 0.57\,(10) - 4.3 \\ &= \quad 7.2 \quad + \quad 18.2 \quad + \quad 12.0 \quad + \quad 5.7 \quad - 4.3 \\ &= \quad 38.8 \end{aligned}$$

His actual score, however, was 49.3. The prediction was in error 10.5 points or 21.3 percent of the actual score.

An idea of the adequacy of the prediction formula can be found from a comparison of the distribution of the 443 actual Stanford scores with a distribution of the errors of prediction (Table III, Figure 2). The average Stanford score of the group of 443 scores was 55.7. The actual scores range from 16 to 93. Now if one knew nothing about a child except that he was a member of the group the best prediction that could be made would be the average score, 55.7. The differences between the actual scores and this predicted value would be the errors of prediction. In other words, the distribution of scores may be considered a distribution of errors of *prediction based on minimum knowledge* and so compared directly with the distribution of the actual errors of prediction by the formula.

If the prediction formula were perfect, the entire 443 errors would be zero; that is, would be represented by a line 443 units tall at 55.7 on the base line. Actually only 60 percent of the predictions fall within five points of the average. The formula, therefore, is far from perfect.[6] On the other hand, it should be noted that the number of errors falling within five points is raised

[6] The standard deviation of the entire group of 443 scores is 13.75 points. A perfect prediction formula would reduce this to zero. The formula given above reduces it to 6.0 points or a reduction of 56 percent of the total. This means that 44 percent of the variation is still unaccounted for. It is known that chance variation amounts to approximately 3 points or 22 percent. The balance or 3 points (22 percent) is the maximum that can be predicted from environmental factors. In any event, the actual variation in individual score to be attributed to the distinctive effects of environmental factors cannot be more than a small absolute amount.

by using the formula from 33 percent to 60 percent and that the number falling within 10 points is raised from 60 percent to 90 percent. Considering the known imperfections in the measur-

TABLE III. ADEQUACY OF PREDICTION FORMULA

Comparison of errors of prediction based on minimum knowledge with errors based on the prediction formula 443 cases

Scale A[a]		Scale B[b]	
Scores	Frequency	Scores	Frequency
(1)	(2)	(3)	(4)
90	1	35	
85	5	30	
80	5	25	
75	18	20	
70	19	15	3
65	48	10	19
60	54	5	78
55	73		125
50	72	− 5	143
45	63	−10	56
40	49	−15	14
35	28	−20	2
30	6	−25	2
25	1	−30	1
20		−35	
15	1	−40	
Mean	55.7		0.25
S. D	13.75		6.5[c]
Scores within 5 points			
Number	145		268
Percent	33		60
Scores within 10 points			
Number	267		402
Percent	60		90

[a]Scale A = Scale for actual Stanford scores.
[b]Scale B = Scale for deviations of Stanford scores from 55.7, and for deviations of scores predicted by formula from actual scores (reduced to common basis).
[c]The standard deviation becomes 6.0 points if figured directly from the errors of prediction.

ing instruments used, the attenuating effect of the play of chance factors, and the lack of validity in the formula, accuracy of prediction seems to the writer startlingly high. Improvements in tests and in testing will certainly increase not decrease the accu-

racy of prediction. However, even with these gross measures, the place for the distinctive influence of home, church, and social factors is small.

The accuracy of prediction is shown by the fact that for 86 percent of the children the maximum error of prediction will

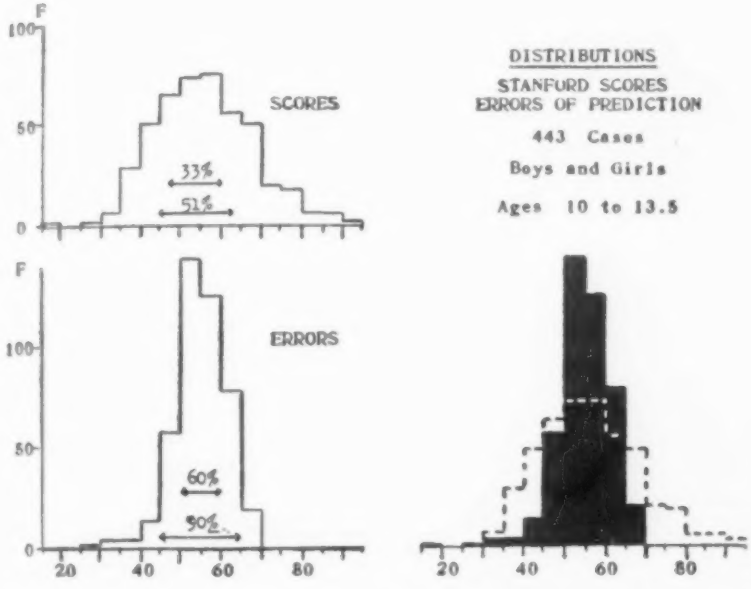

FIGURE 2. COMPARISON OF DISTRIBUTION OF ERRORS OF PREDICTION BASED ON MINIMUM KNOWLEDGE (UPPER DIAGRAM) AND ON SCORES PREDICTED BY FORMULA (LOWER DIAGRAM)

The lower right-hand figure represents both distributions, one superimposed on the other to show adequacy of formula. It reduces the standard error of estimate from 13.75 to 6.04 and raises the number of small errors (within five points) from 33 percent to 60 percent.

not be greater than 15 percent and that on the average it will be 6.5 percent. That is, if a child's score is 50, for eight children out of ten the predicted score will on the average not be lower than 47 or higher than 53. Further, the known facts, about the degree of variation in score caused by mere chance factors, make it probable that chance is sufficient explanation of

this amount of variation. To the writer the data seem to warrant the conclusion that the scores of eight children out of ten may be considered as determined by known differences in heredity, maturity, and training. The score of two children out of ten may possibly have been influenced to some degree in a distinctive way by environmental factors, but the amount of such influence will on the average be small. Also, refinements of technique are likely to reduce rather than increase this possibility.

(*To be continued*)

THE SOURCES OF SPENCER'S *EDUCATION*

H. G. Good
Ohio University

As a distinguished pioneer in chemistry, as a Unitarian divine and theologian, as a materialistic philosopher, as the defender of free speech and rational conduct—a defense which brought him almost within sight of martyrdom—in all these ways, Dr. Priestley is remembered by the educated world. As a writer on education he has been long neglected, although his views deserve attention on their own account and perhaps even more on account of the marvelous currency they attained when they were reminted and re-issued just a century after Priestley had first put them in circulation. The new coinage bore the name and stamp of none other than Herbert Spencer.

Of the four papers now comprising Spencer's volume on *Education*, the first to be published was entitled "The Art of Education." It now forms the second chapter of the volume and is called "Intellectual Education." The third chapter is on "Moral Education," and the fourth on "Physical Education." One may remark that here Spencer has placed last what, in his theory, is of first and paramount importance.

His skill in exposition never failed him, but the seasoned reader of educational literature will find little that is novel or brilliant in these three chapters. Most of the ideas are taken from Rousseau, "whom Spencer had not read," and from Fellenberg, Bacon, Richter, Combe, and especially from Pestalozzi. In many cases the views are credited to their authors, but the style and the illustrations are Spencer's. Otherwise there is little that is new.

With the first and introductory chapter entitled, "What Knowledge Is of Most Worth?" matters are quite different. In this section no credit is given to anyone except for two or three subordinate statements. By implication Spencer admits his originality, and the main argument has always been credited to him.

Broad general influences have indeed been traced but only such as are seen in every writer who is the child of his own period. From the evidence at hand it appears that few if any direct and immediate sources have been suggested. The paper seems fresh and original even now after sixty-five years.

From the first the paper attracted attention wherever English was read. Spencer's American admirer, E. L. Youmans, wrote him in regard to a book that Youmans intended to edit: "There is still another article . . . . in the *Westminster* . . . . "What Knowledge Is of Most Worth?" which I wish to include. . . . I concluded before I had read a page of it that you wrote it; the full perusal strengthened my conviction." Spencer replied acknowledging authorship but requesting that the essay be not republished; he himself shortly included it in the volume, *Education* (1861).

The regard in which Spencer is held today may best be shown by a few brief quotations:

"Of all that has been written in English, during the present century, probably no pedagogic treatise has attracted more widespread attention, or has exerted more influence than Herbert Spencer's *Education*."[1]

"It is not until the middle of the nineteenth century, when the organization of the natural sciences had become perfected, that a modern presentation of their educational claims could be made. The first of these, and yet the most influential, at least for Anglo-Saxon thought, was that by Herbert Spencer . . . . Rousseau's influence is evident, but the thought appears in a radically modified form . . . . Since Spencer is the one English writer on the subject of education during the nineteenth century that has exerted any particular influence and received any particular attention, many criticisms not altogether valid are passed upon his ideas."[2]

Heman gives Spencer a section and speaks of his great vogue in teachers' colleges in America.[3] Graves refers to his originality and thinks Spencer's one of the greatest minds the world has ever known: a most extraordinary over-estimate.[4] Archer de-

[1] Williams, S. G. *History of Modern Education.* Syracuse, New York, C. W. Barden Company, 1892. p. 373.
[2] Monroe, Paul. *Textbook in the History of Education.* New York, Macmillan Company, 1905. pp. 684ff.
[3] Heman, Friedrich. *Gesch. d. Neuren Padagogik.* (Rev. by Moog), 1921.
[4] Graves, F. P. *Great Educators of Three Centuries.* New York, Macmillan Company, 1911. pp. 274ff.

nies both the originality and the cogency of his arguments but stresses their influence upon educational thought and practice.[5] He thinks this effect was the result of Spencer's great reputation in other fields: an explanation which does not account for the immediate interest because in 1860 Spencer's great reputation was still in the future. The first volume of his *Synthetic Philosophy* appeared only in 1866. Compayré regards the whole book on education as merely a clever restatement of the Émile. "Thanks to an amazing gift of expression, he clothes the ideas of others magnificently."[6] Cubberley regards him as a great scholar, which is just what Spencer was not.[7] He was versatile, fertile in ideas, marvelously productive, but he had not the accurate, careful, compact, well-disciplined mentality of the scholar. As an intellectual leader in his generation this lack was his greatest fault. He is a glaring example of a large class—a class which includes Rousseau—those, who, though without education themselves, or with a very one-sided one, try to teach others what education is and how it should be conducted.

From the passage quoted and many others it is clear that Spencer's influence is asserted far more strongly than his originality, and that the latter is thought to consist chiefly in a clear analysis and a novel restatement of the meaning of the nineteenth-century scientific movement, of its influence on education, and especially of its views upon the comparative values of studies. It is the thesis of the present article that Spencer's argument in "What Knowledge Is of Most Worth?" is not a condensation of the thought of his generation upon education, but that it is an expansion of the specific ideas of Joseph Priestley. While Spencer's words are those of the nineteenth century the ideas are those of the eighteenth. To the consideration of this thesis we shall turn presently.

---

[5] Archer, R. L. *Secondary Education in the Nineteenth Century.* New York, Macmillan Company, 1921. pp. 120-21.

[6] Compayré, Gabriel. *Herbert Spencer and Scientific Education.* New York, Crowell Publishing Company, 1921. p. 108.

[7] Cubberley, E. P. *The History of Education.* Boston, Houghton Mifflin Company, 1920. p. 777.

About 1760, while Joseph Priestley was engaged in teaching in a Non-Conformist academy, he wrote an "Essay on a Course of Liberal Education for Civil and Active Life." Five years later, in answer to John Brown who had argued for a system of national education under state control, Priestly issued his "Remarks on a Proposed Code of Education." Sir Michael E. Sadler has called this essay "the *locus classicus* in English literature of the eighteenth century for Non-Conformist arguments against national organization of education by the State acting in concert with the Established Church."[8] Making the acquaintance of Benjamin Franklin, Priestley was stimulated to carry out some electrical experiments and to write, with Franklin's approval and the loan of some books, *The History and Present State of Electricity*, a work which prepared the way for the election of its author to membership in the Royal Society in 1766. "Indeed it may be truthfully said that Franklin made Priestley into a man of science."[9] It would be curious if it should turn out that Franklin also made him into an educational writer, and there is some evidence for such a conclusion. At any rate, there may be some traces of Franklin's influence in Priestley's third and longest educational paper, the "Miscellaneous Observations Relating to Education, More Especially as It Respects the Conduct of the Mind."

Now, if we take these three papers, the "Essay," the "Remarks," and the "Observations," arrange them in this order, the order of their composition, select the pertinent sections, and summarize them for comparison with a similar summary of the argument in Spencer's "What Knowledge Is of Most Worth?" we get the interesting results shown below. It is to be kept in mind that the order of presentation of both Priestley's and Spencer's ideas is closely followed except as noted, and that in both summaries the language of the originals is retained without quotation marks wherever it seemed desirable.

---

[8] Monroe, Paul. *Cyclopedia of Education*. New York, Macmillan Company, 1912. Vol. I, p. 454.

[9] Thorpe, T. E. *Joseph Priestley*. New York, Macmillan Company, 1906. p. 63 *et passim*.

Parallel Passages

PRIESTLEY

It seems to be a defect in our present system of public education, that there is no course of studies provided for gentlemen who are to enter active life. Schools offer no proper opportunities for those who are to be neither mere clerks nor professional men but men of affairs. And in the new posture of national, international, and business affairs this is an important class. And there is a great deal of new knowledge, social, political, economic, and commercial which this class needs. Other nations will apply this knowledge, and we must do so or we will be left behind. It is certainly our wisdom to contrive that the studies of youth should fit men for the business of manhood.

Those who have performed the most important services for their country received little of the knowledge necessary to their work at school or the university. So remote from the business of civil life is the general course of study that the severe and proper discipline of a grammar school is become a topic of ridicule. Boys are sent there not to learn but simply from custom or to form connections which are likely to be useful in future life. This appears by the little solicitude parents show about their sons being grounded in those sciences, in which they themselves might have been considerable proficients, but which, from their being foreign to the business of life in which they were afterwards engaged, they have now wholly forgotten.

SPENCER

Not only in times past but almost as much in our own era, that knowledge which conduces to personal well-being has been postponed to that which brings applause. Throughout his after-career, a boy, in nine cases out of ten, applies his Latin and Greek to no practical purposes. The remark is trite that in his shop, or his office, in managing his estate or his family, in playing his part as director of a bank or a railway, he is very little aided by this knowledge he took so many years to acquire—so little that generally the greater part of it drops out of his memory; and if he occasionally vents a Latin quotation or alludes to some Greek myth, it is less to throw light on the topic in hand than for the sake of effect. If we inquire what is the real motive for giving boys a classical education, we find it to be simply conformity to public opinion. Men dress their children's minds as they do their bodies, in the prevailing fashion.

[So far from the "Essay." This was introductory to some history syllabi. The content of these syllabi is used later.]

The "Remarks" contain an argument against state control of education that agrees well with Spencer's general position. See especially his *Social Statics*. The "Remarks," as a separate publication, I have not seen; but the material was included by Priestley in his "Essay on Government" (1768). He there argues "against established modes of education" on the ground that "education is a branch of civil liberty, which ought by no means to be surrendered into the hands of the magistrate."[10]

PRIESTLEY

The aim of education is not to form a shining and popular character but a useful one.

Education is necessary because life is short and the necessary knowledge, although it might indeed be obtained in the natural course of things is liable to be obtained too late and to be too unsystematic to serve its purpose. By education also each generation builds upon the work of its predecessor and progress is thereby accelerated.

[The second section of the "Observations" is entitled, "Of the Objects of Education and their Relative Importance."] The general object of education is to qualify men to appear to advantage in future life, this aim can only be realized by communicating to them such

SPENCER

In order of social development decoration precedes dress. So in education we dress children's minds as we do their bodies, for show.

[This point precedes the section in Spencer previously given.]

Had we time to master all subjects we need not be particular. But we that have but span-long lives must ever bear in mind our limited time for acquisition. And remembering how narrowly this time is limited, not only by the shortness of life, but also still more by the business of life, we ought to be especially solicitous to employ what time we have to the greatest advantage. [In Spencer this language occurs just after the paragraph following.]

The undeveloped state of education is shown by the fact that we have no reasoned theory of the relative worth of knowledges and hardly any conception of the exist-

[10] See pp. 76-109 of the edition of 1771.

knowledge and leading them to form such *habits,* as will be most useful to them hereafter; and in this *the whole of their future being,* to which their education can be supposed to bear any relation is to be considered. [The above, including italics, is an almost exact quotation. But in this connection it is to be recalled that Priestley was a Christian minister and meant to include in the whole of life, a future life.]

Religion is readily seen to be the first rational object of education, for whatever the fate of one's children in this world, that in the world to come is paramount.

The second object of education is clearly subsistence because life must be sustained in order to make possible any course of conduct. Those persons, therefore, who have no other means of subsistence, must be instructed in such arts as will enable them to support themselves to the most advantage.

The wealthy need only train their children to such pursuits as will qualify them to be most happy in themselves, and most useful to others; yet considering the instability of all human affairs, prudence dictates that all should be taught the means of self-support against a possible reverse of fortune. The wealthy should especially devote themselves to the cultivation of estates and to scientific pursuits. Of the latter the most liberal, honorable, and pleasant is the study of nature, with its two divisions of *natural history* and *natural philosophy,* the study, that is, of the objects and facts of

ence of a standard for judging this worth. A measure of value is here the first requisite. This is found in the concept of complete living—how to live not only in a material sense but how to live completely. The only rational mode of judging any educational content or procedure is to determine the degree to which it prepares us for complete living.

Those forms of activity which constitute complete living, mentioned in the order of their importance, are the following: (1) the activities of self-preservation, (2) those needed for subsistence, (3) those that pertain to the rearing and training of offspring, (4) those that promote social and political relations, and (5) those leisure activities that gratify taste and feelings. That these stand in their true order of importance seems evident, for personal safety must precede all others before they can become possible. So also subsistence must precede the assumption of parental functions and thus through the list.

Some knowledge is of intrinsic value, some of quasi-intrinsic value and some of conventional value. Science is of the first kind, language of the second, and ordinary history of conventional value only. Further, every acquirement has importance as knowledge and also as discipline.

For all the five activities which comprise complete living, science

nature and of the principles and laws of nature.

Now all the arts of human life, from the exercise of which is derived everything that tends to the security and happiness of mankind, depend upon a knowledge of those powers of nature with which we are conversant; and the only possible way of increasing the conveniences of human life, of guarding against the inconveniences to which we are subject, and of enlarging the powers of man, is a farther acquaintance with the powers of nature and their application and control.

Among these arts which depend directly upon science are agriculture, the use of metals, architecture, navigation, fortification and war, all labor-saving devices and inventions, the avoidance of accidents, even of the destructive power of lightning itself, the cure of disease; all depend upon and are derived from an acquaintance with the laws of nature. The great superiority of modern over ancient times is due to our greater knowledge of nature.

The study of natural science offers an endless course of investigation, of the greatest variety and interest, investigation which is freely open to all and which requires patience rather than penetration for its successful pursuit.

Political knowledge, or an acquaintance with those regulations which most eminently contribute to society, is, in fact, a branch of philosophical [= scientific, in Priestley] knowledge, and is, therefore very far from being in-

is the best preparation. For direct self-preservation, hygiene, and physiology are most important. For subsistence also science gives the essential preparation. Except for a few people all men are engaged in the production, preparation, and distribution of commodities. All of these operations depend upon the sciences of mathematics, mechanics, physics, chemistry, biology, and sociology. That which our school courses omit most nearly concerns the business of life. All our industries would cease were it not for that information which men begin to acquire as they best may after their education is said to be finished. Had there been no teaching but such as is given in our public schools England would now be what it was in feudal times. That increasing acquaintance with the laws of phenomena which has through successive ages enabled us to subjugate nature to our needs, and in these days gives the common laborer comforts which a few centuries ago kings could not purchase is due to science but not taught in schools. And so for the remaining divisions, science, by which is meant a knowledge of the laws of nature and of human nature, is the necessary and sufficient basis and preparation.

Descriptive sociology provides the information needed for intelligent social and political action. History in the past has been a mass of unorganizable facts: facts of no service in establishing principles of conduct. Only of late years have

consistent with any other branch of natural knowledge. Political knowledge is obtained from two sources, the study of history and the study of human nature. History [as one may gather from the syllabi mentioned above] should deal, not with gossip and personalities, but with the sources of the greatness and power of nations and peoples. It should include the history of commerce, of the technical arts, manufactures, trade, credit, coinage, colonies and colonial policy, the balance of trade, and of all that makes a nation happy, populous, and secure; accounts of the forms of government, civil and ecclesiastic and the relations between these two; the history of civil and criminal law, of constitutions and the administration of justice; the story of the rise of social and political classes; descriptions of the manners, food, dress, dwellings, and of progress in the modes of living; accounts of family life and the relations between the sexes. Accounts of the state of education, science, invention, art, and religion. History in a word is to be the history of civilization. [This is a very condensed and inadequate summary of what Priestley includes in history as shown by the syllabi of his three courses of lectures.]

The study of human nature, and of human laws and government is another most important and distinct object of attention in a course of liberal education. By natural philosophy we mean the knowledge of the external world, but by moral philosophy we mean the knowledge of the structure of our own minds, and its various affections and operhistorians begun to give us really valuable information. Now that the welfare of nations rather than of rulers is becoming the dominant idea, historians are beginning to occupy themselves with the phenomena of social progress. That which it really concerns us to know is the natural history of society. We want all facts which help us to understand how a nation has grown and organized itself. Let us have an account of its government, central and local, of the ecclesiastical government and its relation to the State; of the creed and religious ideas, both the nominal ones and those actually effective; of the relations between class and class including social observances, salutations, customs; of the relations between the sexes; of the industrial system, the division of labor, the regulation of trade, the agencies of distribution, the coinage, the technological arts and processes; of the intellectual state of the nation and the progress of science, invention, architecture, sculpture, dress, and the arts; of the daily lives of the people, their food, their homes, and their amusements. Lastly, to connect the whole, should be exhibited the morals of the nation. The historian must not be content with cross-sections; but he is to show progress. This information will be useless however unless we have also a sound knowledge of human nature, a biology, and a psychology, without which rational interpretation of social phenomena is impossible. [This is a relatively full summary of Spencer on history which in the original covers only half a dozen pages.]

ations, of which it must be acknowledged that very little is known, but into which we begin to get some light especially from the observations of Mr. Hobbes, Mr. Locke, and, above all, Dr. Hartley. This knowledge of human nature is the proper ground of everything that is called political knowledge, or a knowledge of the interests and conduct of men as connected in society; or the terms on which men must live so as to derive the greatest benefits and suffer the least inconveniences. To solve political problems we must apply all our knowledge of the present state of society, of the history of past ages and of human nature.

It is the greatest recommendation of natural science that its study tends to promote a spirit of piety by exciting our admiration of the wonderful order of the Divine Works and Divine Providence; marks of consummate wisdom and perfect goodness constantly inspiring the student with reverence, love, and confidence. [This passage is not in its proper place here. It occurs at an earlier point in the "Observations."]

Great excellence in any of the elegant arts is an unfavorable circumstance to youth. It begets excessive and ridiculous vanity. It is only an acquaintance with more liberal and manly science, and an extensive view of what has been attained, and what yet remains to be attained by man that inspires true dignity and true humility.

Even for the fine arts, science is basic, but the arts while important should be subsidiary. As they occupy the leisure part of life so they should occupy the leisure part of education.

As science is most important for guidance so also is it most important for discipline. It would be utterly contrary to the beautiful economy of nature, if one kind of culture were needed for the gaining of information and another kind were needed for mental gymnastic. For discipline of the memory, of the judgment, for moral discipline, and for religious culture science is most useful and effective.

The study of science is itself a tacit worship; the laws of nature teach us of an inexorable but beneficent uniformity; and from the humility induced by the study of nature come true conceptions of self, of man, and of nature. We conclude, then, that for discipline, as well as for guidance, science is of chiefest value.

Thus to the question with which we set out—"What Knowledge Is of Most Worth?"—the uniform reply is Science.

Although the parallel here drawn is a close one, the two writers also express divergent views. Important examples are found in their attitudes toward religion and toward the teaching of the classics. There is no mention in Priestley of preparation for family life and the rearing of children. On the other hand, Priestley treats many matters which are here omitted because Spencer omits them, and therefore no comparison could be made: noteworthy is a short passage upon transfer of training. In their Non-Conformist position, their opposition to state control of education, their individualism, their radical attitude on science, their utilitarianism, the two men agree closely. It is not strange that Herbert Spencer should have gone to this intellectual ancestor of his for ideas; but it is singular that the debt should not have been discovered before; and it is noteworthy that the debtor on every occasion fought vigorously in defense of his various claims for priority. In regard to "What Knowledge Is of Most Worth?" such claims will now have to be abandoned. Spencer's chief additions to Priestley's eighteenth-century thought were a slashing style and a brilliant faculty for special pleading. Few, if any, other writers on education have attained a great reputation so cheaply; but perhaps fame rarely conforms to the facts.

Many pages have been filled with criticism, fair and unfair, of Spencer's "unfair but justifiable" essay.[11] It may turn out that the best criticism is the implicit one of a simple historical parallel which shows that Spencer's ideas were the ideas of the unhistorical and "enlightened" eighteenth century; but it would require a historian and many more pages to show what that means.

[11] For an example of keen, but I believe, fair criticism see R. L. Archer, *op. cit.*, pp. 120 ff.; and also the delightful papers by Josiah Royce, *Herbert Spencer, An Estimate and Review*. New York, Fox, Duffield and Company, 1904.

EDUCATIONAL RESEARCH IN 1925[1]

M. R. TRABUE
University of North Carolina

The volume of research in educational fields is growing so rapidly that it will soon be necessary to limit the annual summary by the president of this association to a few narrow fields, or to extend "leave to print," or to accept a relatively brief report on the year's research literature. I have ventured to adopt the third possibility this year, namely, a brief report.

I shall follow in several details the summary which Dr. Ashbaugh, my immediate predecessor, used in his presidential address last year. I shall do this partly to save time necessary to make clear any new devices which I might have chosen to employ. Whether, however, the data I present are entirely comparable with those presented last year is a debatable question. I have examined with some care Dr. Ashbaugh's report and the bibliography on which it was based;[2] and I have attempted to include in this summary only those studies which I consider equal in merit to those named last year. It is by no means certain, however, that the differences which I shall point out between the two reports are due to actual changes in the various fields of research. These differences may be due, at least in part, to the different points of view from which Dr. Ashbaugh and I would classify the same research projects.

The readers will recall the excellent statement made in last year's report concerning the difficulty of deciding what study should be called research. Should the length of the report be a determining factor in this decision? Is it necessary that all the data be presented, or may one accept as research a report in which large numbers of measurements are summarized by a few

[1] Presidential address delivered before the Educational Research Association at Washington on February 22, 1926.

[2] Ashbaugh, E. J. "A Bibliography of Research Articles Published in 1924," *Journal of Educational Research*, 11:368-79, May, 1925.

simple index numbers? Should a magazine article in which the author of a scientific monograph quotes data and conclusions from his longer report be included in this summary of the year's research in education? These are some of the simpler questions confronting one who undertakes to summarize the reports for any given year.

It would be almost impossible to find every study published—even in such a complete educational library as Ohio State University has built up, but in our little educational library at the University of North Carolina, one can be certain that many important reports will not be discovered. I carefully examined the magazines on our library shelves and supplemented my bibliography by such reviews and announcements as I could find. Many significant pieces of research have probably been omitted, but any inadequacy in this report must be attributed to lack of resources rather than to personal bias.

Educational Journals

Table I compares the number of research articles found by Ashbaugh in each of the magazines for 1924 with the number found by the compiler for 1925. The only publication included by me that your former president omitted—probably intentionally—is the *Educational Research Bulletin* of the Ohio State University. Thirteen of the articles published in this bulletin during 1925 seemed to me worthy of a place in this annual summary. Several of the magazines found productive in 1924 were not available for the 1925 compilation. I have also omitted all local state teachers' journals, although an occasional research article may be found in them.

The authorship of the 277 articles reported for 1925 is worthy of attention. Sixty-nine percent were written by members of the staffs of colleges and universities; 4 percent, by graduate students; and 7 percent, by persons whose institutional connections I could not determine. Only 20 percent of the authors were listed as officers of schools other than colleges, and many who gave their public-school titles were evidently writing

their reports in close connection with college courses and instructors. Personally, I wish this Association might in some

TABLE I. MAGAZINE ARTICLES REPORTING EDUCATIONAL RESEARCH DURING THE YEARS 1924 AND 1925

Name of Magazine	Number of Articles	
	1924	1925
Journal of Educational Psychology	43	53
Journal of Educational Research	51	47
Elementary School Journal	20	28
School and Society	18	26
School Review	28	24
Educational Administration and Supervision	12	23
Teachers College Record	7	14
Educational Research Bulletin (Ohio State University)	.... [a]	13
Journal of Applied Psychology	2	8
American School Board Journal	4	7
Pedagogical Seminary	....	5
School Science and Mathematics	....	5
English Journal	9	3
Mathematics Teacher	4	3
Journal of Abnormal and Social Psychology	1	3
Educational Record	....	2
Psychological Clinic	....	2
Journal of Educational Method	3	2
Public Personnel Studies	....	2
Catholic Educational Review	6	2
Scientific Monthly	....	1
Mental Hygiene	....	1
Education	2	1
Journal of Experimental Psychology	....	1
Childhood Education	....	1
Peabody Journal of Education	17	.... [b]
American Educational Digest	7	.... [b]
Journal of Rural Education	5	.... [b]
American Schoolmaster	4	.... [b]
American Physical Education Review	3	.... [b]
Educational Review	2	.... [b]
Pennsylvania School Journal	1	.... [c]
Total	249	277

[a] Not considered in 1924.
[b] Not examined in 1925.
[c] No local state journals were included in 1925.

way stimulate the men in public-school positions to engage more extensively in the work of educational research. Almost a third

(32.9 percent) of the articles reviewed for 1925 were written by members of the Educational Research Association, as contrasted with the one-sixth of the published articles that came from members last year. I hope that the increased proportion of reports emanating from this organization indicates a permanent growth in activity rather than the mere difference between the standards for research held by past and present presiding officers.

TABLE II. FIELDS OF EDUCATIONAL RESEARCH REPORTED IN MAGAZINE ARTICLES DURING 1924 AND 1925

	Total*	
	1924	1925
Administration	**64**	**49**
Child-accounting	21	10
Teachers	9	3
Buildings	1	2
Cost (finance)[b]	7	6
General	26	28
Curriculum and Supervision	**59**	**74**
Construction	9	1
Materials	21	25
Errors	7	9
Learning (and study)	14	34
Miscellaneous	8	5
Educational Tests	**32**	**20**
New	7	7
Criticism	2	2
Use and correlation	23	11
Intelligence Tests	**46**	**57**
Criticism	8	5
Interpretation	5	12
Correlation	6	14
Use of classification	8	7
Use in (schools and colleges)	8	14
Miscellaneous	11	5
Other Types and Tests	**13**	**20**
Physical efficiency	5	.....
(Health knowledge)	.....	1
Character (behavior)	2	4
Will—Temperament	2	3
(Personality)	.....	2
(Typewriting)	.....	2
Short-answer tests	.....	2
Effort	1	.....
Weigh consequences	1	.....
Book reading test	1	.....
Rating (of pupils)	1	1
Manual dexterity	.....	1
(Vocational achievement)	.....	1
(Social perception)	.....	1
(Social attitudes)	.....	1
(Educational psychology)	.....	1
Statistics	**24**	**17**
Reliability	9	4
Formulae, etc	8	8
Prediction	2	2
Others	5	3
Miscellaneous	**11**	**40**
Applied to (schools and colleges)	7	15
Marks and examinations	.....	12
(Vocational interests)	.....	4
(Ethics of teachers)	.....	1
Others	4	5
(History of education)	.....	3
Total	249	277

*The numbers printed in bold-faced figures are the totals for the corresponding classificatory groups. The sums of these numbers equal the totals given at the end of the table.

[b]Those parts of the titles of classifications which appear in parentheses did not appear in the corresponding table prepared by Dr. Ashbaugh for the year 1924.

Perhaps some of the improvement may be attributed to the eloquent appeal for greater productivity made by Dr. Ashbaugh at the close of his report last February.

Tables II and III present summaries of the distributions of magazine articles for 1924 and 1925. It will be observed in Table III that in 1925 only one article dealing with child-accounting in secondary schools seemed to me worthy of a place in this summary, while Ashbaugh found seven in 1924. This difference may be due to the fact that I classified under the general head of "Miscellaneous" in Table II five studies of high-school marks. Other striking differences between the data presented for the two years may in like manner be due to differences in classification rather than to actual differences in the types of researches reported. I shall therefore leave the interpretation of the differences revealed in the tables largely to your own thought.

The substantial growth in the number of reports on "Learning (and Study)," especially in the elementary field, stands out in Table III. This growth in the number of articles dealing with the materials and methods of learning is decidedly encouraging. Perhaps this also is a response to the appeals made last year by the president and by Dr. Henmon. Whatever the cause and however large the growth of interest during the past year, increasing attention to the problems of learning in the classroom should be given by all members of this Association.

Perhaps it is noteworthy that the number of articles dealing with intelligence tests increased from 46 to 57, of which 29 were related to elementary-school pupils, 15, to high-school pupils, and 13, to college students. On the other hand, the number of purely statistical articles this year was only 18 while last year it was 24. Presumably, I should not have placed so large a number of articles in the miscellaneous class, but I found in my predecessor's list no other general classification in which forty of the reports appearing in 1925 could be placed. Of the 277 articles tabulated for the year 1925, 9.4 percent which did not pertain to any particular period of school life, were mainly studies of statistical devices, of the history of education, and of other mat-

ters related in a general way to all education. The remainder of the reports are definitely assigned to school periods; 35.4 percent, to elementary education; 31.4 percent, to secondary education; and 23.8 percent, to higher education.

TABLE III. RESEARCH ARTICLES WHICH APPEARED IN 1924 AND 1925 CLASSIFIED ACCORDING TO LEVELS OF THE SCHOOL SYSTEM

	Elementary		Elementary and Secondary		Secondary		Secondary and Higher		Higher	
	1924	1925	1924	1925	1924	1925	1924	1925	1924	1925
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Administration										
Child-accounting	4	2	4	2	7	1	1	....	5	5
Teachers	2	1	2	1	3	....	1	....	1	1
Buildings	....	....	1	2	....	....	....	....	....	....
Cost (finance)*	....	2	5	1	2	1	....	....	....	2
General	2	9	11	5	7	8	....	....	6	6
Curriculum and Supervision										
Construction	1	1	3	....	3	....	....	....	2	....
Materials	5	12	8	2	4	4	....	1	4	6
Errors	4	5	1	....	1	4	....	....	1	....
Learning (and study)	9	20	2	3	1	5	....	1	2	5
Miscellaneous	2	3	2	....	1	1	1	....	2	1
Educational Tests										
New	3	1	2	1	2	2	....	....	....	3
Criticism	2	2	....	....	....	....	....	....	....	....
Use and correlation	17	5	2	....	2	4	1	2	1	....
Total	51	63	43	17	33	30	4	4	24	29

*See footnote *b* Table II.

Books and Booklets

Sixty-four volumes of books and monographs containing important reports seem to be worthy of mention in the annual bibliography of educational research for 1925, though my reading list was no doubt incomplete. Twenty-eight of the sixty-four were taken from the list of "Teachers College Contributions to Education"; thirty were published by colleges, universities, teachers' associations, and individual educators; six were published by commercial publishing houses, and two of the six

were volumes of the "Educational Finance Inquiry" published by Macmillan Company.

My classification of the sixty-four volumes of educational research published in 1925 follows:

	Number of Articles
Administrative problems, concerned with	
Organization	6
Finance	6
Programs	5
Efficiency	5
Children	3
Physical plant	2
Higher education	1
Total	28
Supervisory problems, concerned with	
Methods of instruction and learning	13
Errors in performance	3
Surveys of results	3
Curriculum materials	2
Special types of instruction	2
Total	23
Abstract research problems, concerned with	
Tests and their correlations	6
History of education	4
Statistical devices	3
Total	13

It is interesting to find in bound as well as in periodical literature the same tendency to emphasize research in classroom learning and instruction. If we can now in some way give more attention to the materials of the curriculum, it should not be long before classroom teaching may be based upon a firm scientific foundation.

General Observations

It may not be advisable for this summary to single out individual research reports for praise, but I have been deeply impressed by certain studies. Perhaps the reader, with other interests, would select a different list of reports as being unusually excellent, but without intending to undervalue any other studies produced in 1925, I wish to express publicly my appreciation and respect for that scholarly study by Dr. S. A. Courtis, entitled

Why Children Succeed. I have no doubt that we shall long look back to it as one of the milestones in the progress of educational research.

I wish to mention also at this time the *Summary of Investigations Relating to Reading* by W. S. Gray, and the *Summary of Investigations Relating to Arithmetic* by Judd and Buswell. Although chiefly composed of restatements of previous reports, these summaries of research will prove valuable to all of us.

In the periodical literature I was especially delighted by the numerous studies being published by Gates and his students in the field of elementary-school learning. If the reader was not present at the meetings of Section Q of the American Association for the Advancement of Science in this city a year ago, I recommend for reading in the September issue of *Scientific Monthly*, Dr. Courtis' account of the development of educational measurements, entitled "The Construction of Measuring Instruments in the Field of Education."[4] The best article published in the *Journal of Educational Research* during 1925 was, in my judgment, one by P. T. Rankin in the June number entitled, "Effectiveness of Half-Day Sessions."[5] It was in many ways a model of scientific scholarship in our field.

Closely related to educational research, but not within the limits of the bibliography on which this summary is based, are textbooks in statistical methods. The year 1925 will be notable in the history of educational publication for the large number of excellent books in statistical methods which it produced. Odell's *Educational Statistics*, Chaddock's *Principles and Methods of Statistics*, Rugg's *Primer of Graphics and Statistics for Teachers*, Chambers' *Introduction to Statistical Analysis*, Thurstone's *The Fundamentals of Statistics*, Otis' *Statistical Method in Educational Measurement*, and Holzinger's *Statistical Tables for Students in Education and Psychology* set a high-water mark for publications in this field.

[4] Courtis, S. A. "The Construction of Measuring Instruments in the Field of Education," *Scientific Monthly*, 21:260-90.

[5] Rankin, P. T. "Effectiveness of Half-Day Sessions," *Journal of Educational Research*, 12:1-16, June, 1925.

In conclusion I wish to repeat two suggestions which have frequently been made but none too frequently followed: (1) More attention should be given to research in the materials and methods of classroom instruction. We must somehow determine what to teach with as much scientific precision as we have begun to employ in determining how to teach. (2) We must use greater care to make certain that the conclusions we state in our reports follow logically from the data presented. Too many reports state conclusions that are not fully supported by the research data included in them. This association should interest itself in the quality as well as in the quantity of educational research.

THE COUNTY SUPERINTENDENT OF SCHOOLS AS SUPERVISOR OF INSTRUCTION

F. P. O'Brien
Director, School Service and Research
University of Kansas

As a supervisor of instruction the county superintendent holds a position of great potential influence for promoting public-school efficiency. In many states most of the teaching force and a majority of the pupils in the public elementary schools are almost entirely dependent upon that officer for direct guidance or supervision of instruction. From these schools an increasing number of children each year enter high schools in which they must compete with other pupils trained in elementary schools having better organization and better trained teachers than they had.

For example, it is estimated that one-third of the one hundred and thirteen thousand pupils in the one- and two-teacher elementary schools of Kansas are taught by inexperienced teachers,[1] and that 70 percent of the teachers in these schools have had not more than high-school training. On the other hand, only 7 percent of the pupils attending graded elementary schools in the state are taught by inexperienced teachers, while three in every four of the teachers in the graded schools have had more than a high-school training.[2]

Furthermore, the county superintendent in Kansas has supervision over an average of ninety teachers in the more populous counties, whereas in city school systems in the same counties the median number of teachers is considerably less than ninety. In the city systems a superintendent, several principals, and several supervisors may share in the supervising of instruction, while

[1] Kansas. *Twenty-third Biennial Report of State Superintendent of Schools.* Topeka, Kansas, State Superintendent of Public Instruction, 1920. pp. 201 ff.

[2] *Results of Instruction in Different Types of Elementary Schools in State of Kansas.* Pittsburg, Kansas, K. S. T. C. Press, 1922. p. 46.

the county superintendent alone is responsible for supervision of instruction in the ungraded rural schools.

Since the effectiveness of instruction in the rural elementary schools is probably no less dependent upon adequate supervision than it is in the city graded schools, and since the function of supervision in the rural schools is centralized in one person, it seems appropriate to inquire how much time in general that officer devotes to what, in any fair sense, may be called supervision. Likewise, it is expedient to ascertain how adequate is his preparation for the kind of specialized work which is involved in acceptable supervisory practice.

An investigation of these facts concerning the county superintendent's job was recently undertaken, a carefully prepared questionnaire being used for the purpose. The information sought was obtained in fairly complete form from seventy-seven of the hundred and five counties of Kansas. The superintendent was asked concerning the extent of his experience as superintendent and of his school experience preceding that position. He was asked concerning the distribution of time among his various duties, the number and length of school visits made by him, the relative importance of the considerations to which he devoted his attention on these visits, and the extent of his own educational and professional training. Of the number who provided the information twenty-four were men and fifty-three were women.

In general, these superintendents cooperated fully in making their replies as complete and accurate as possible according to the data upon which they were based. Their estimates of how their time was in general distributed among their various duties are shown in Table I. Seventeen county superintendents devoted 5 percent or less of their time to school-board conferences and meetings, but the median percent of time estimated as given to that activity was 8.6. In caring for general office duties the median was 41.3 percent; in visiting schools, 26.0 percent; in community and school programs, 6.8 percent; in all other duties not included in those named, 8 percent. According to

their own estimates, these county superintendents spent, on the average, as much time in doing office work as they did in the three other duties named in Table I.

Since the number of schools varies widely in the different counties, even the same percent of time spent in visiting schools may not provide visits equal in number or equal in length for the schools visited. The superintendents who had full-time

TABLE I. THE PERCENT OF TIME SPENT BY SEVENTY-SEVEN COUNTY SUPERINTENDENTS IN VARIOUS OFFICIAL ACTIVITIES

Percent of Time	School Board Conferences	General Office Duties	Visiting Rural Schools	Community Programs, etc.	All Other Duties
(1)	(2)	(3)	(4)	(5)	(6)
5 or less	17	.....	2	23	17
6–10	26	1	4	25	14
11–20	12	9	19	4	13
21–30	3	12	16	2	2
31–40	2	8	10	.....	.....
41–50	1	15	12	.....	.....
51–60	.....	6	2	.....	.....
61–70	.....	4	1	.....	.....
71–80	.....	5	.....	.....	.....
81–90	.....	1	.....	.....	.....
No data	16	16	11	23	31
Median percent	8.7	41.3	26.0	6.8	8.1

assistants to handle the office details were able to give an average of 45 percent of their time to visiting schools, while those having no office assistants spend only 20 percent of their time visiting schools. However, even this difference is conditioned by the fact that the former group had nearly twice as many schools to visit.

It is obviously quite necessary to know the number and length of visits per school actually made by this county school officer. The numbers of visits per school made in one year as reported by seventy-seven superintendents have been tabulated as shown in Table II. This table makes clear the fact that in general three out of every five schools, 62.9 percent, were visited only

once during the year. One-fourth of these schools, 25.9 percent, were visited twice, and 11 percent of them were visited three times or more. No information is at hand to indicate who were the teachers visited the more frequently, whether they were the younger and the more inexperienced teachers, or whether they

TABLE II. NUMBER OF VISITS PER YEAR BY THE COUNTY SUPERINTENDENT TO EACH SCHOOL AND THE AGGREGATE OF SUCH VISITS

	Number Visits per Year							
	1	2	3	4	5	6	More Than 6	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Aggregate number	2,730	1,109	308	153	28	8	2	4,338
Percent of total	62.9	25.9	7.1	3.5	.6	.....	.....	100.0

were others. Since a minimum of one yearly visit, of not less than one hour, to each rural school in the county is prescribed by law, with a penalty of five dollars for each school missed, it may be observed how great is the tendency of the superintendent not to exceed this prescribed minimum.

The prevailing length of official visit to these schools was not greatly in excess of one hour, as may be seen in the following tabulation:

Hours Spent per Visit	Number of Superintendents
.75	1
1.0	22
1.25	14
1.5	23
1.75	6
2.0	7
2.25	3
2.5	1
	77

Visits having an average length of one hour were reported by twenty-two superintendents; seven reported average visits of two hours in length; and four reported average visits of still greater duration. The median length of the visits by the seventy-

seven superintendents was 1.4 hours. There was probably much less tendency to underestimate than to overestimate the length of these visits. For example, the practice has prevailed of counting the time spent within the district as though it were time actually spent in the school. Consequently, if one assumes that the average length of these visits did not exceed one and a quarter hours, it may be a fair approximation to their usual length.

It appears, then, that the direct opportunity for supervision of instruction in these schools lies in one visit per year of approximately one hour and a quarter in length. Yet it is not at all certain that supervision and improvement of instruction command the major part of the superintendent's attention during even these brief visits. In view of this uncertainty an effort was made to ascertain how these officials usually distribute their time among the matters inviting attention when they visit a school.

A list of sixteen different items relating to physical, instructional, community, and routine matters was presented in the questionnaire. The superintendents were asked to rank them according to the amount of time devoted, in general to each of them. Care was taken to avoid indicating by the order or phraseology of these items anything as to their relative significance. For similar reasons no attempt was made to have the items in this list well defined. The list of items which were to be ranked by the superintendents is given in Table III.

Not all of the superintendents who responded made the suggested ranking. Eight left it blank, while twenty-four ranked practically all of the items 1, 2, or 3, on the basis of time given to each. In this way several items were ranked "1" by the same individual and several others "2" or "3." One may wonder whether that was actually the way their time was distributed or whether they were simply unwilling to commit themselves more definitely. Their replies are summarized in Table III. This table shows that six of the sixty-nine superintendents whose replies were tabulated ranked *School buildings* first; while three others ranked buildings fifteenth. *Instruction methods* was ranked first more frequently than any other item on the list.

TABLE III. SUPERINTENDENTS' RANKING OF THE ITEMS LISTED, BASED UPON TIME CONSUMED BY THEM IN SCHOOL VISITS

	Rank															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School building	6	5	6	1	2	7	7	2	2	5	3	3	2	2	3	0
School furniture	3	6	3	1	4	6	5	4	3	4	3	3	2	5	0	0
Teaching equipment	9	8	1	5	7	3	3	5	8	2	1	1	2	0	1	0
Playgrounds	5	6	4	5	1	8	3	5	2	4	2	2	3	3	0	0
Discipline	9	7	15	6	1	1	5	1	0	0	3	4	1	1	2	1
Instruction methods	23	12	7	4	4	1	1	0	0	0	0	0	0	2	0	1
Organization work	18	17	7	3	2	1	1	2	1	1	0	2	1	1	1	0
Talks to pupils	8	5	9	7	6	4	2	6	4	0	2	1	3	0	2	0
Sanitation	6	6	9	3	3	5	6	2	2	4	5	3	1	2	0	0
Special activities	3	6	5	0	3	1	5	2	3	2	0	5	4	3	4	1
School library	4	5	4	4	3	2	5	5	5	4	5	1	3	0	0	0
Teacher conferences	18	15	9	6	3	3	2	1	1	3	1	2	0	0	0	0
Criticisms and advice	8	7	7	4	7	3	2	3	2	1	2	1	1	2	1	0
Heat, light, ventilation	8	6	3	4	3	3	1	0	6	6	3	1	3	1	3	0
Settling difficulties	5	6	11	4	4	3	2	5	2	2	4	6	4	1	1	1
Any other activity	3	2	3	1	0	0	0	2	1	0	1	0	1	3	4	9
Total	136	119	103	58	53	51	50	45	42	38	35	35	31	26	22	13

There is, of course, no certainty as to how the different individuals interpreted such items as "instruction methods" or "organization work," but these, together with "teaching equipment" and "teacher conferences," may be regarded as more or less directly concerned with improvement of instruction. One or more of these four items was ranked "1" a total of 68 times of the 136 "firsts." The same items were ranked next to the highest in 52 of the 119 responses recorded in that rank. It is of course possible that some other items, such as school library, may sometimes be closely related to supervision of instruction, but probably more frequently they are of a merely formal nature.

Notwithstanding a striking lack of agreement among the county superintendents as to relative emphasis upon individual items, it is still apparent that there is a dominant tendency to place relatively high in rank those items which seem in general to be concerned with supervision of instruction. But even the high ranking given to such items would not warrant an assumption that they receive more than half of the time devoted to school visits. If this be true, then the average time devoted to what may be called supervision of instruction in these schools is little more than a half hour per year.

It may be assumed that what is attempted by the county superintendent in the way of constructive supervision and the effectiveness of his efforts in that direction are closely related to his own experience and training. The kind of school positions he has previously held may be considered as to some extent indicative of his previous teaching experience. The following statement shows the positions held by these superintendents immediately preceding their present positions:

Type of Position	Number
Rural teacher	20
Grade teacher	15
High-school teacher	10
Elementary-school principal	15
High-school principal	8
City superintendent	8
Total	76

Although the position of county superintendent involves the direction of elementary-school instruction, yet some of the occupants of that office had had no previous experience in elementary-school teaching. The position likewise involves organizing and directing the work of scores of teachers, yet 60 percent of these superintendents had not had any previous administrative experience. Moreover, considering the nature of their teaching experience, it is quite improbable that more than a few of these superintendents had as teachers come into direct contact with effective supervision. No information was available to indicate how many of these school officers had been enrolled as students in courses dealing with administration or supervision in the modern sense, or how many of them had read books dealing with these subjects. Although more than half of them had already served one or more terms as county superintendent, yet since there is a change every two years of nearly one-half of these educators, few could remain long in one place.

Concerning the professional training of these superintendents no facts were available excepting that nearly 60 percent of them had never attended a summer school of any kind to improve their professional fitness. The 40 percent which had attended summer school had an average attendance of eleven weeks. These two facts may provide a partial index of their general professional attitude since the average length of their teaching experience was twelve years, and each of the state educational institutions has offered a variety of teacher-training courses each summer. The extent of general schooling of the sixty-nine superintendents who provided this information is indicated in Table IV. Twenty-one of them, 30 percent, had received only a high-school training or less. Almost the same number had received more than two years of college or normal-school training.

The prevailing tendency, as shown here, is for the office of county superintendent to be held by persons who have had one or two years of training in a college or normal school. Even if this training were efficient and adapted to their needs it would still seem to be inadequate in extent for a position of such poten-

tial influence in public-school education. It is at least interesting to note that those who were trained in a normal school usually made longer visits to their rural schools than did those trained in college. One may wonder whether the college-trained person can accomplish as much in less time or whether the low salary

TABLE IV. THE EXTENT OF SCHOOLING OF COUNTY SUPERINTENDENTS

	High-School Training		College or Normal School		Total
	None	1 to 4 Years	1 or 2 Years	3 or 4 Years	
(1)	(2)	(3)	(4)	(5)	(6)
Number of superintendents	5	16	28	20	69
Percent of total	7.2	23.2	40.6	29	

and other limiting conditions bring about the selection of the sort of college-trained persons who are in general content with lesser accomplishment.

Whatever may be disclosed regarding the training, experience, or efficiency of the county superintendents, the fact still remains that the salary is insufficient to command the services of competently trained educational leaders for this potentially important position. The following table shows the salary distribution:

Salaries	Number of Superintendents
$ 800 or less	6
801 — 900	1
901 — 1,000	0
1,001 — 1,100	0
1,101 — 1,200	8
1,201 — 1,300	6
1,301 — 1,400	1
1,401 — 1,500	6
1,501 — 1,600	38
1,801 — 1,900	2
1,901 — 2,000	6
Total	74

The median salary per year received by the seventy-four county superintendents reported here was $1,524.68. This salary is equivalent to $127.05 per month for a period of twelve months.

Summary

1. The supervision of a majority of the pupils and teachers in the elementary schools of the state is dependent almost entirely upon the county superintendent of schools.

2. This official makes approximately one visit a year, averaging one and a quarter hours, to each rural school in the county. The distribution of his time during such visits indicates that approximately half the visit is devoted to activities that pertain to supervision of instruction.

3. A majority of the superintendents have not had previous experience in supervision, and some are without experience in elementary-school teaching. Their restricted schooling and their limited professional training make it unlikely that they will realize the larger possibilities of the position.

4. The salary is too small to attract the type of supervisory officer that is so urgently needed.

COMPARATIVE EFFECTIVENESS OF THE LECTURE-DEMONSTRATION AND INDIVIDUAL LABORATORY METHOD

FRED G. ANIBEL
Central High School, Kansas City

The purpose of this study was to determine scientifically through the use of objective data just how the results of the lecture-demonstration method of presenting natural science subject-matter compared with the individual laboratory method of presenting exactly the same material. The principal factor under consideration was the degree of mastery of the subject-matter by the student as determined by both informal and standardized tests. The data collected during the study were also used in making comparisons between bright and dull groups, in determining the degrees of retention of the acquired information, in estimating the time required to teach by each of the two methods under investigation, and the relative costs.

The experiment was carried out in the Chemistry Department of Central High School, Kansas City, Missouri, during the school year 1922-23. A check study was made the following year using the methods of the first study. Two classes were selected each year as groups for the experiment. One class received the instruction by lecture-demonstration entirely, and the other was used as a control group receiving the instruction by the regular method of individual laboratory work.

Balancing groups.—In order to eliminate other factors which might influence results, the two classes were balanced as nearly as possible on the basis of ability as determined by standardized intelligence tests. In the original study, both classes were first given the Army Alpha Test, Form 9. About two weeks later, the same classes were given the Otis Group Test, Form B. Because of the limited period, forty-five minutes, the Otis Test was shortened to six tests by the omission of tests 1, 6, 9, and 10. The tests were conducted by an expert from the Department of Research and Efficiency of the Kansas City public-school system.

All scoring was done by this department and all results rechecked. There was a positive correlation of 0.81 between the scores of the Army Alpha and the Otis Group for these two classes.[1]

Two groups of presumably equal intelligence were then selected in the following manner. A student from the lecture-demonstration or test group was paired, for the purpose of comparing achievement records, with a student from the individual laboratory class or control group. This pairing was made on the basis of the score on Army Test checked with the Otis score. Some students were shifted from one group to the other in order that the groups might be about equal in intelligence. After the adjustment there were thirty pairs available for the experiment.

The same procedure was carried out the next year in adjusting two groups included in the check study. In this second experiment, only seventeen pairs were selected. The arrangement of the equal ability groups into pairs is shown in Tables I and II.

Method of experiment.—After the two groups were balanced, the experiment was continued in the following manner. All classes in chemistry met five times per week for forty-five-minute periods. The classes were shifted weekly so that the time in the laboratory was equal to the time in the classroom. The classroom instruction was identical for the two groups, thus equalizing any factors that might be present in classroom instruction.

Both groups were in the laboratory the same week. The class receiving the work by lecture-demonstration met the second hour of the morning from 8:45 to 9:30. The Control Group met immediately after the special test group in the same room from 9:30 to 10:15 o'clock. The experiments were presented before the assignment of the textbook material covering the same chemical principles. This procedure made the instruction inductive and less likely to be influenced by classroom discussion.

---

[1] Thurstone's correlation sheet published by the Carnegie Institute of Technology was used to determine the correlation coefficient in this case. The Otis scores were used to determine the position in ranking where two students in the same group made the same score on the Army Alpha Test.

The method of instruction for the Control Group was the same as given in all the regular classes. The Test Group received the same experiment on the same day as the Control Group. The class was assembled before the demonstration table so that every student could conveniently watch the experiment as it was carried on by the instructor. Each student in both groups was provided with a printed instruction sheet containing directions and questions designed to bring out the principles of chemistry involved. The apparatus and materials used in the demonstration were the same as those called for in the direction sheets used by the Control Group. The instructor was careful not to teach by direct exposition in the case of the Test Group. The facts were presented, but the student was left to formulate his own generalizations. This procedure is a little unfair to the lecture-demonstration method as carried on in actual practice, but it is better for an objective measurement of the results where the point in question is a matter of method. Twenty-five experiments were carried out with the two groups in the original study, and the same twenty-five experiments were used the next year in the check study with two similar groups.

Scoring results.—In the original study the results of the two methods of instruction were compared by the marks on regular examinations every five weeks and by laboratory tests given every laboratory week. These laboratory tests covered all the experiments given during the week. The examination covered both the laboratory and recitation work for the five weeks.

The laboratory tests on the experiments, either performed or observed by the student, consisted of a large number of questions carefully worded so that the correct response to each consisted of a single word, one formula, or an equation. Ten questions of this type were given on each experiment. The control class was given identically the same tests and examinations. Since there was only a three-minute intermission between classes, there was little opportunity for information as to the nature of the questions to be passed on to the Control Group. In case any such practice was carried on, the effect on the final results would

TABLE I. GENERAL INTELLIGENCE SCORES AND ACHIEVEMENT SCORES FOR THE LECTURE-DEMONSTRATION AND INDIVIDUAL LABORATORY GROUPS ARRANGED BY EQUAL ABILITY PAIRS

Pair Number*	Test Group Lecture-Demonstration			Control Group Individual Laboratory		
	Army Score	Otis Score	Achievement Score	Army Score	Otis Score	Achievement Score
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1...	98	84	50	99	74	75
2...	103	.....	.....	101	83	53
3...	105	82	59	107	90	57
4...	108	85	49	102	75	.....
5...	116	91	57	117	86	73
6...	118	78	49	120	93	.....
7...	120	93	45	123	98	.....
8...	121	85	.....	121	83	58
9...	121	102	59	122	88	63
10...	122	84	86	121	85	53
11...	123	88	.....	126	84	65
12...	123	104	49	128	100	79
13...	128	87	59	129	81	61
14...	132	87	64	132	107	43
15...	133	97	50	136	92	57
16...	135	81	69	135	92	73
17...	140	103	53	139	102	60
18...	141	101	73	142	82	71
19...	142	90	81	142	93	78
20...	146	111	72	147	109	66
21...	151	99	52	139	91	57
22...	153	114	83	149	104	88
23...	154	106	58	152	105	58
24...	156	113	82	152	94	49
25...	157	115	80	159	105	73
26...	157	110	73	159	109	.....
27...	159	101	85	155	92	67
28...	160	118	78	161	119	60
29...	165	108	81	160	114	84
30...	176	112	84	168	102	80
Mean	139.6	99.6	68.0	138.7	99.6	66.3

* Pairs 2, 4, 6, 7, 8, 11, and 26 are not included in the total because part of the data was not completed.

tend to show results in achievement scores for the Control Group which would be slightly higher.

This testing of results in achievement was made objective in

order that the answers to the questions would not require discussion. Specific answers were required and the yes-and-no and true-and-false types of questions were eliminated from the tests and examinations because of the possibility of guessing. The papers were scored by marking the answer to the question either right or wrong and then reducing the score to a percentage basis

TABLE II. GENERAL INTELLIGENCE AND ACHIEVEMENT RECORDS CHECK EXPERIMENT

Pair Number	Test Group Lecture-Demonstration			Control Group Individual Laboratory		
	Army Score	Otis Score	Achievement Score	Army Score	Otis Score	Achievement Score
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1...	68	86	67	81	83	56
2...	88	74	63	78	75	56
3...	99	92	56	84	102	35
4...	88	74	65	84	104	59
5...	101	98	61	112	93	39
6...	132	110	63	132	105	46
7...	133	114	69	118	131	85
8...	133	123	75	123	130	81
9...	140	121	67	142	118	64
10...	138	116	70	135	121	70
11...	139	115	82	125	127	75
12...	149	124	81	146	131	76
13...	152	132	76	149	131	80
14...	142	145	64	147	140	77
15...	180	145	75	164	148	90
16...	159	139	90	155	145	81
17...	185	142	85	186	146	92
Mean	130.9	114.7	71.11	127.0	119.4	68.35

for each paper. In order further to eliminate the possible subjective element in the scoring of the papers, the sets of papers from the two groups were shuffled together and the entire set graded as they came.

In testing results in the check study made the next year, ten experiments out of the twenty-five were selected, and the results of instruction based on these. The ten were not selected for content but because of the time element in conducting the laboratory.

Some weeks it was possible to examine on more than one experiment, but on other weeks the time was so limited that only enough questions could be given to get complete results for only one of the experiments which had been performed during the week. Since the ten selected experiments were distributed uniformly throughout the whole semester, these scores were taken as sufficiently accurate to check the results of the study made the year before.

The average scores in achievement on a percentage basis are presented in columns *4* and *7* of Tables I and II. In both the original and in the check study the group doing the experiments entirely by the lecture-demonstration method ranked slightly higher in achievement than the Control Group. In the original study, the lecture-demonstration group did 1.7 percent better in achievement while in the check study the lecture-demonstration group did *2.7* percent better in achievement.

Bright and dull groups.—A comparison between the achievement ratings received by the pairs of lower ability and those made by the pairs of higher ability is presented in Table III. The pairs are ranked in order of their ability as determined by the scores on the intelligence tests. The upper half of the test has a lower degree of intelligence than the lower half. The results in achievement for each half are compared with the results in achievement for the other half. As indicated on the table, for the nine pairs of lower ability the average difference between the achievement scores is 3.11 points in favor of the group taught by the individual laboratory method. Also in six cases, the students taught by the individual laboratory method did better than their partners instructed by the lecture-demonstration method when compared with three instances in which the reverse was the case. The achievement scores of only nine pairs are reported in this half of the groups, because either one or the other member of each of the other six pairs had dropped from the class because of inferior work before the final achievement records had been determined.

TABLE III. COMPARISON BETWEEN SCORES IN ACHIEVEMENT OF BRIGHT AND DULL GROUPS

Pair Number	Achievement Scores		Differences in Scores	
	Lecture Demonstration Group	Individual Laboratory Group	In Favor of Lecture Demonstration	In Favor of Individual Laboratory
(1)	(2)	(3)	(4)	(5)
	Lower Intelligence Group			
1	50	75		25
2				
3	59	57	2	
4				
5	57	73		16
6				
7				
8				
9	59	63		4
10	86	53	33	
11				
12	49	79		30
13	59	61		2
14	64	43	21	
15	50	57		7
Difference		28		28
Average Diff.		3.11		3.11
	Higher Intelligence Group			
16	69	73		4
17	53	60		7
18	73	71	2	
19	81	78	3	
20	72	66	6	
21	52	57		5
22	83	88		5
23	58	58		
24	82	49	33	
25	80	73	7	
26				
27	85	67	18	
28	78	60	18	
29	81	84		3
30	84	80	4	
Difference	67		67	
Average Diff.	4.79		4.79	

In comparing the mean averages in achievement for the pairs of higher intelligence, the differences are greater and favor the lecture-demonstration method of instruction. The difference between the average achievement score for the members of the pairs doing the work by the lecture-demonstration method is 4.79 points better than the average score for the students of equal ability doing the work by individual laboratory procedure. In this half of the group, there are eight instances where the student in the Test Group did better work than his equal-ability partner in the Control Group as compared with five instances where the reverse was the case. Only fourteen pairs are considered here, because one student of the twenty-sixth pair left the class not because of inferior work, as was the case in the lower intelligence group, but because he was transferred to another school.

These results seem to indicate that the students of higher general intelligence profit more by the lecture-demonstration method of instruction than do the students of relatively lower general intelligence. Such results might be expected, since students of high average ability are better able to understand and appreciate through observation and explanation than students of low or only average ability who require a closer contact with the information presented and need to learn through the exercise of more of the senses.

Retention results.—A test of the achievement was given to the two groups of the check study five months after the instruction of the Test Group by lecture-demonstration had been discontinued. During the intervening five months, both groups had been taught by the regular individual laboratory method. The material presented during the intervening five weeks was entirely new subject-matter to both groups. As indicated in the table, the laboratory group scored higher on the test than did the group which had been instructed by lecture-demonstration. Each group, however, scored higher than the norm given for the same school level. The mean average score for the demonstration group was 57.5, for the laboratory group 60.85, and

the norm given by the author in standardizing the test is 44.5. These results slightly favor the individual laboratory method for retention if the difference is large enough to indicate any variation at all.

The questions on the standardized test were carefully analyzed, and the scores made on those questions relating to the first semester's work were separated from the scores made on those questions relating to the second semester's work. The work of the first semester was done by the Test Group by lecture-demonstration and by the Control Group by individual laboratory method. These data on the questions relating to the first semester's work alone, then, represent the retention of each group after an interval of five months. The lecture-demonstration group made a mean average score of 28 for the first half of the work, and the individual laboratory group made a mean average score of 38 on the same material. This would seem to indicate more significantly that the work is better retained, when done by individual laboratory procedure than when done by lecture-demonstration procedure. There were, however, only ten pairs available for the retention test, so these results are not strictly comparable to the results in immediate retention where more pairs were used.

Time element.—The primary object of the study being to determine the comparative effectiveness of the two methods of presenting the laboratory instruction, there was no systematic recording of the time element. It was quite noticeable, however, that the time required by the group doing its own work was considerably greater than the time required by the instructor to perform the same experiment.

Commonly in the first-class high school, two full periods are scheduled for the performing of one experiment in elementary chemistry. This is usually from seventy-five to ninety minutes. During this study, the class doing its own laboratory work was required to complete the shorter experiments within the forty-five-or more accurately, the forty-two-minute, period. This practice required the previous preparation of much of the material

before the students assembled to perform the experiment. The longer experiments were divided, and two periods allowed for their completion. This resulted usually in three complete experiments per week.

One of the control factors of the experiment was to present the same material each day to each group. It was soon discovered that an abundance of time was allowed in the forty-five-minute period for presenting by demonstration any of the twenty-five experiments used in this study. The tendency on the part of the instructor naturally would have been to extend the scope of the experiment whenever time was available. This was avoided, because of the necessary control features of this particular study. The practice was rigidly adhered to of presenting exactly the same amount of material each day to each group. The extra time thus made available to the demonstration group was used by the students in other study work, since they were not permitted to work in the laboratory. It can be conservatively estimated that fully one-third less time is required for the lecture-demonstration method of presenting the laboratory instruction material.

Comparative costs.—When the experiment is demonstrated before the class, only one set of apparatus and enough material for performing the experiment the one time are required. When the same experiment is performed by the students, there must be supplied as many sets of equipment as there are student groups working.

The Control Group (individual laboratory class) was divided into fifteen laboratory sections with two students to each section. Exactly fifteen times as many sets of apparatus and supplies of material were required for the group doing individual experiment work as for the presentation of the same information to the same number of students by the lecture-demonstration method.

The current cost then was fifteen times as much where the work was carried on by the individual laboratory method as in the case where the work was presented by the lecture-demonstra-

tion method. This estimate does not take into consideration the first cost of equipping a laboratory for individual experimentation as compared with the cost of the equipment necessary in the lecture room for demonstrating the experiments.

Conclusions

An interpretation of the data presented seems to justify the following conclusions regarding the lecture-demonstration method of teaching high-school chemistry in comparison with the individual laboratory method of presenting the same subject-matter:

1. The immediate retention is fully as adequate when the material is presented by the lecture-demonstration method as when the class is taught by the regular individual laboratory procedure. Indications are that the lecture-demonstration procedure would result in better immediate retention.

2. The delayed retention is so little different that one method may be considered as good as the other. There was a slight indication that the material was better remembered when taught by individual laboratory procedure.

3. The brighter students are likely to profit more by the lecture-demonstration method than are the others.

4. The lecture-demonstration method requires about two-thirds as much time for presenting experiments as does the regular individual laboratory method.

5. The cost of the lecture-demonstration method is much less than the cost of teaching by the individual laboratory method. This study showed the current cost to be about one fifteenth as great for the lecture-demonstration method as for the individual laboratory method.

TRAINING RESEARCH WORKERS

C. C. CRAWFORD
University of Idaho

Educational progress in America might be accelerated if more people were trained in a definite way for research investigation. Such training is not given on a large scale except in universities; and even universities are turning out a comparatively few persons equipped to do this work.

The scarcity of university-trained research workers is to be explained in two ways. First, the recruiting program is inadequate. Many students fail to enter research, because they have not been encouraged so to do and have not known the joy of original investigation. The advertisers of merchandise attach coupons to their advertisements to make the purchase easy for the customer; they remove every possible obstacle to his choice. Yet the university has, to a certain degree, assumed that the student who by temperament should become an investigator will brush aside all barriers and force his way into the field of research. The recruiting is further handicapped by the discouraging reports of the struggles of graduate students which the Juniors and Seniors in the university often hear. These unfortunate graduate students, many of whom are attempting to do research work for their theses without adequate training or guidance, leave the impression on prospective candidates for higher degrees that the preparation of a thesis is almost a superhuman task and that it is presumption for any but a few geniuses to dare to attempt it. Why should anyone dread the thesis requirement if he has been properly trained for the work?

A second cause of the inadequate supply of trained research workers lies in our failure to train effectively those recruits whom we get. As long as the research necessary to prepare a thesis is on a plane of blind and helpless floundering, the common result will be that the student upon the completion of his thesis will heave a sigh of relief and determine never to undertake such a task again.

Large-scale methods of training research workers should be adopted. A well-known German industrialist recently expressed the belief that German automobile manufacturers could learn much from the American large-scale production of standardized automobiles. May the universities not learn a similar lesson from the automobile industry? Some may suggest that research cannot be standardized. Possibly not. Complete standardization would be most undesirable. We need Packards as well as Fords and trucks as well as sedans; but each of these standardized automobiles is produced in large quantities. Likewise, we can reduce our training for research to fundamental principles and types more than we have done up to the present time.

The chief advantages of large-scale production of standardized automobiles are the economy of production and the interchangeability of parts. These advantages apply likewise to large-scale production of standardized research workers. The individual-apprenticeship method demands that a high-salaried professor devote a relatively large amount of time to a single student. This time is devoted to instruction in methods of investigating the *specific problem* on which the student is working. The result is a loss of economy with a failure to teach fundamental principles of research. Many advantages would result from the cooperation of research men in different fields and from the coordination of their work. The method by which they are trained often makes this difficult, because they do not know the same scientific language nor think in terms of the same principles of procedure. In other words, they do not enjoy the advantage of *interchangeability of parts*.

Viewing the question historically, we find several facts which by analogy point to the need of supplementing the present apprenticeship method by direct instruction in regular courses in research and by large-scale or group methods. Organized schools have replaced apprenticeship and individual methods of instruction. Professional training for teaching has replaced the older plan of letting teachers learn how to teach by practicing on helpless children. Vocational education in school classes is rapidly

replacing vocational apprenticeship as a means of preparing for the job. Colleges and universities are turning, in ever-increasing numbers, to the policy of giving Freshmen special courses in methods of study instead of leaving them to find out how to study by a more or less unguided apprenticeship. If the Freshman needs to be trained for the task of doing undergraduate work, how much more does the graduate student need definite training for the infinitely more complex and technical work of original investigation?

There are several faults which may distort the extreme type of individual instruction for research workers. It is apt to have a one-sided result, because it usually involves much drill on one or two aspects of the problem with the comparative neglect of the other branches of the field. Translated into terms of industry this means that the apprentice is shown how to perform a certain operation and is kept at it for the period of his apprenticeship but is given little opportunity to learn the whole process. Methods and principles of research are also apt to fail to reach the level of conscious generalization. The student learns to apply certain principles of procedure; but his interest is in the application rather than the principle, and he may never see that the principle applies to another problem.

Expert research men are sometimes not gifted in training apprentices in the methods of investigation. They may know the work so well that they do not realize that they are exceeding the comprehension of their apprentices. They, also, may not have their procedures formulated in a definite way. Expert salesmen often cannot tell others how to become good salesmen. They have acquired the necessary skill themselves but have not raised it to the level of conscious formulation and, therefore, cannot teach it to others. The same difficulty is found even in the university; professors who can do creditable research work sometimes have difficulty in teaching others how to do it.

Such individual apprenticeship is also apt to waste time. It wastes the professor's time, because he has to repeat his work with each student; it wastes the student's time, because he is

apt to spend unnecessary hours in trial-and-error blundering on things which could have been taught once for all if he had had a regular course in methods of research. The following program of training for research workers may be suggestive:

A Suggested Program

I. The collection of suitable material bearing on the methods of research.—The three principal sources of such material are:

1. *Available reports of scientific investigations.*—The summarization of these data would involve the sifting out of the best contributions to be found in books on historical and statistical methods, as well as a substantial body of periodical literature. Much useful material has not been reduced to printed form and would have to be collected from other sources.

2. *Professors and deans of graduate schools.*—Much wisdom concerning methods of research has been gathered from experience and is stored in the memory of the professors who have been directing students in their theses. By interviewing[1] these men and recording their suggestions concerning the methods of planning and carrying out investigations in their respective fields, we could secure a wealth of material that would be invaluable for the guidance of others.

3. *Graduate students.*—From interviews with graduate students much might be learned regarding the difficulties met in the process of making investigations and in formulating the reports. These difficulties may have been overlooked by the deans and professors directing graduate work.

II. Teaching this material in a regular course.—The course in research methods should resemble other courses in form and should include the use of textbooks, lectures, quizzes, and laboratory exercises. Such a course should be given equal status with any other scientific or professional course. Instruction should be given in class groups rather than individually; and all prospective graduate students should be allowed the opportunity of taking it, regardless of the subject or field in which they expect to do their graduate work.

This course should be offered during the first semester of the senior year to all students who give promise of research ability and followed in the second semester by courses in methods of research in the various fields such as natural science, historical research, statistical methods, etc. Various reasons for placing it in the senior year may be given. Such a course would reach more students in the senior year than later, it would be instrumental in inspiring Seniors to remain for graduate study and

[1] *See* Charters, W. W. "Collecting Unrecorded Specifics," *Journal of Educational Research*, 5:280-94, April, 1922.

research. Also much of the ordinary feeling of dread that attaches to the idea of preparing a thesis would thus be overcome. After such a course the student would enter the graduate school ready to begin work, and even if he did not return for graduate study such training would be valuable as a preparation for practical research work in his chosen field of activity.

III. Giving assistance to individual students.—Each graduate student should receive all the individual direction and training possible in connection with his actual research work.

The foregoing program of direct and formal training in methods of research is not intended to *replace* individual work but is rather to serve as a foundation for it and to make possible the continuance of individual work on a higher level.

Editorials

THE POSSIBILITIES AND LIMITATIONS OF TRAINING

Notwithstanding all our advances in the field of mental and educational measurements, we are still grossly ignorant about many things on which measurement ought ultimately to throw light. Educational practices involving tens of millions of dollars are adopted without the slightest scientific evidence as to what the effects on pupil achievement are likely to be. No one knows to what extent the limits of achievement are set by intelligence, as measured by our best present-day tests. No one knows to what extent our so-called "intelligence" scores are themselves measures of achievement rather than of true intelligence.

Dr. Burt, the London psychologist, thought he had proved statistically that a child's mental age is attributable to training much more than to endowment. Holzinger and Freeman show that by applying Burt's statistical methods to his own data it is possible to prove that a child's *chronological* age is also largely attributable to training; in other words, Burt's alleged proof is statistical nonsense. On the other hand, the Courtis monograph *Why Children Succeed* purports to prove that 97 percent of a child's school achievement is due to intelligence and maturity, and only 3 percent to the school's efforts. Miss Burks shows in the current number of this journal[1] that this appalling conclusion does not logically follow from the author's data. In regard to the relative influence of nature and nurture on intelligence and achievement scores, the most important question in education, we have but the scantiest evidence and that is to some extent ambiguous.

[1] See pp. 382-84.

The states that rank low on any reasonable scale of educational efficiency rated low in the army intelligence tests; those of high educational rank rated high in intelligence. Question: Do the army intelligence scores merely reflect school training, or is an intelligent population indicative of better schools? Children of educated and cultured parents score better in both intelligence and achievement tests than do children of ignorant parents. Are such differences environmental in origin and therefore eradicable, or are they but the inevitable expression of native differences in endowment? A final answer is not yet at hand.

No one knows that it would not be possible, by intensive training in infancy, to give all children I.Q.'s of 140 or higher, nor does anyone know that such training would have any appreciable effect on the intelligence quotient. We are similarly uncertain with respect to the possibility of making Negroes the equals of Whites in intelligence and achievement by equalizing their educational advantages. No one has satisfactorily demonstrated that the sib correlation of approximately 0.50 in intelligence-test scores is due to similarity of heredity rather than to similarity of environment. The Chicago and Stanford studies of adopted children may help to solve this age-old problem. Nor has anyone proved that such differences as we find in pedagogical skill between the best ten and the poorest ten teachers out of a hundred, taken at random in a city school system, make any material difference in the achievement of their pupils. Further no one has shown that pupil achievement is measurably affected by the number of educational and pedagogical courses their teachers have pursued, by the salaries their teachers are paid, or by the difference between superior and inferior school equipment.

Probably a third of the children who enter the first grade are below the mental age of six years. A majority of these fail of promotion. Why? Does mental age so govern reading ability that at the mental age of six the most refined arts of pedagogy cannot accomplish what comes almost of itself at the mental age of seven or eight? No one knows. If all children started to school at eight instead of at six and were then allowed to pro-

ceed as rapidly as they could, no one knows that they would not be as far advanced at ten, mentally and scholastically, as they are today. No one knows that they would be.

If one thousand unselected children just completing the third grade were promoted at once to the sixth grade, probably a large majority would fail. If so, would this be due chiefly to skipping the fourth and fifth grades or would it be due to low mental age? Does anyone know that the work of the first six grades could not be mastered in two years by children of mental ages of eleven or twelve? If the last question cannot be answered directly because of our inability to make the experiment, would it be possible to devise an experiment which would answer the question indirectly? Certainly it would be interesting to compare the speed with which mental ages of eight and twelve could assimilate, under controlled conditions, material analogous to that which is taught in the schools. Such comparisons are readily made.

The questions already mentioned are illustrative of the kind that will be dealt with by the *Twenty-Sixth Yearbook of the National Society for the Study of Education* (1927). The committee in charge of the preparation of this yearbook hopes to be able to give valuable information on some of them. More than a score of new investigations have been undertaken at the committee's suggestion. The cooperation of qualified investigators everywhere is solicited. Anyone who has, or who can yet secure, data capable of throwing any light whatever on the nature-nurture problem is requested to communicate with the author of this editorial. Manuscripts for the yearbook should be ready by September 15, 1926.

L. M. T.

Reviews and Abstracts

RUGG, H. O. *A Primer of Graphics and Statistics for Teachers.* Boston, Houghton Mifflin Company, 1925. 139 pp.

As the title suggests, this little book was written for the guidance of classroom teachers in the tabulation, graphing, and elementary statistical summary of such data as test scores, marks, and ages. The topics covered are: graphs, tabulations, averages, measures of variability, frequency distributions, distributions of school marks, and correlation. Only the minimum essentials under each of these headings are included, and the treatment is informal, conversational, and interesting. Moreover, there is an abundance of illustration and explanation. In the reviewer's opinion this book should appeal to about three groups of readers, classroom teachers generally, superintendents, and normal-school and normal high-school training classes. There is probably not a page in the book but can be mastered by a high-school Senior with two years of high-school mathematics and an I. Q. of 110. The author has succeeded in adapting the ideas to the minds of his projected circle of readers. Hence, because of its elementary nature the book will not appeal to the college or university teacher of statistics or measurement.

In view of the widespread popularity of the author's more advanced textbook on the same subject, as well as the inherent worth of the "Primer," there can be little doubt that this book will find a wide sphere of usefulness. Much has been left out, it is true, but most of these omissions are justified.

University of Iowa G. M. RUCH

WHIPPLE, GUY M. and DAVIS, HELEN. *Problems in Mental Testing.* Bloomington, Illinois, Public School Publishing Company, 1925. (Pages not numbered.) (Educational Problem Series, No. 9)

Problems in Mental Testing is a student's manual for a comprehensive study of group intelligence testing by the case-study method. The aim is to present in as concrete a form as possible many practical questions which are certain to face any superintendent undertaking a survey of his pupils by the group-test method, for purposes of sectioning on the basis of ability, promotion, vocational, or educational guidance. In so far as clever word pictures are a true substitute for the real situation, it is the reviewer's opinion that the selection of situations has been extremely well made and presented. Following the presentation of the problem are pertinent exercises to test the student's ability to apply the knowledge which he has gained from a reading of carefully selected references bearing on each situation. The situations number forty-two in all, exclusive of fifteen dealing with general theory, five dealing with special abilities, and ten with statistical problems. Each is a unit in itself, so that one may pick and choose to suit his needs. Alternate blank pages provide plenty of space for notes.

The book will be found most useful to those doing testing in elementary and high school, and for general orientation will be found equally basic for college testing. The author devotes little attention to the extremely important question of a critical determination of the merits of competing tests. However, this lack will be scarcely noticeable to the majority of beginners in testing. The reviewer predicts for the book an enthusiastic reception by all interested in the fundamental first steps of group testing.

Ohio State University HERBERT A. TOOPS

DEARBORN, N. H. *The Oswego Movement in American Education.* New York, Teachers College, Columbia University, 1925. 189 pp. (Teachers College, Columbia University, Contributions to Education, No. 183)

This monograph describes the origin of E. A. Sheldon's work—the ragged school, the free-school idea at Oswego, and the reorganization of the city system—which led to the idea of a teacher-training school, and which finally became the Oswego Normal School. Fifty-two pages deal with the characteristics of object-teaching at Oswego and in England. Descriptions of the student body and its activities, the members of the teaching staff, and the practice schools are given. Useful appendices, illustrations, and tables are included.

The chief conclusions are that (1) Sheldon was not a profound scholar but ranked "high as a humanitarian," (2) that the Oswego Normal sprang from needs of the local schools, (3) that the Pestalozzian method used there was quite similar to that employed in England, (4) that Oswego's influence was more national in scope than that of some other normal schools, (5) that there was great emphasis upon practice teaching, and (6) that the most important single factor that placed Oswego as a most distinctive contributing force in American education was the educational plan of object-teaching.

The first, second, and third conclusions are not open to question. The fourth is true but overemphasized, inasmuch as the author himself shows that 12.4 percent of Bridgewater (Massachusetts) students came from outside the state and that only 1.6 percent more (14 percent) of Oswego students came from outside New York. Letters are quoted showing Oswego's influence on our national education; those who created the normal schools of Massachusetts and Connecticut, and their contemporaries, were equally enthusiastic. In discussing the place of practice teaching at Oswego, it is admitted that the idea of it, in this country, did not originate there. In discussing the practice of several normal schools in this feature of training, reference should have been made to Lexington, where, two decades earlier, Peirce, the principal, said:

The model school was committed to the immediate care of the pupils of the normal school, one acting as superintendent, and two as assistants for one month in rotation; . . . . twice every day the principal . . . . goes into the model school for general observation and direction . . . . I either sit and watch the general operations of the school, or listen attentively to a particular teacher and her class, or take a class myself . . . . After the exercises . . . . I comment upon what I have seen and heard . . . . telling them what I deem good and what faulty . . . . In regard to the materials of which it is composed, and the studies attended to, the model school is as nearly a facsimile of a common district school as one district school is of another. In regard

to the discipline and management . . . . there may be more dissimilarity." —(*Common School Journal*, III, 164-67) From this brief extract it would appear that Lexington rather than Oswego "established a precedent," in regard to practice teaching.

Notwithstanding such a misstatement and overemphasis, the book contributes much detailed information about the growth of Pestalozzianism in American education. Unfortunately, W. S. Monroe's *History of the Pestalozzian Movement in the United States*, which contains about forty pages regarding the Oswego Movement, is omitted from the bibliography.

University of Pennsylvania THOMAS WOODY

STEVENS, EDWIN B. and ELLIOTT, EDWARD C. *Unit Costs of Higher Education*. New York, Macmillan Company, 1925. 212 pp. (Educational Finance Inquiry, Vol. XIII)

It is most fortunate that a study of the cost-analysis for higher education was included in the reports of the Educational Finance Inquiry Commission. Colleges and universities annually spending millions need a clear method of accounting which will make possible more convincing statements of their financial requirements and comparisons of costs among groups of institutions of those items which should be comparable. The movement for measuring the product of higher education cannot make progress independent of adequate methods of determining the cost of the various products measured, and we cannot expect continued public confidence in higher education without better measurements of the results. This report, therefore, is of far-reaching value.

While all the chapters are rich in suggestions and information, the chapter on "The Method of Obtaining Unit Costs" contains the gist of the report from the point of view of a student of education. Detailed methods for calculating the cost of giving one student one clock hour of instruction are shown. Few educational institutions at present maintain systems of account-keeping which make this unit-cost calculation possible, but fortunately Mr. Stevens, one of the authors of this report, is a member of the staff of the University of Washington where unit-cost calculations have been made under his direction for several years. Furthermore, having been the most active member of the Board of Higher Curricula of the State of Washington, which for several years has published unit-cost figures for all five of the institutions of higher education in the state, he brings to his task a wealth of practical experience.

The report contains an explanation of methods of deriving departmental costs, allocating costs of administration, overhead, depreciation, and research. The authors explain also how to assemble data to determine student clock hours for each department and each curriculum. They point out ways of distributing costs for non-instructional activities, and set forth the problem of distinguishing costs per clock hour in lower, upper, and graduate divisions of an institution. When an adequate system of accounts is kept, and when the data on student census are collected, the task of making all these calculations is not very difficult. In fact, the unit costs for two state universities, two state colleges, and four state normal schools are given in considerable de-

tail, revealing facts—particularly variations—which must challenge the administrative officers of those institutions. These facts will prove useful to other institutions which care to make similar studies of their own costs.

It does not seem fitting to detract from the excellence of this pioneer study to debate questions of a minor importance. The reviewer happens to be among those who are not yet convinced that the clock hour is the best unit to use. Besides, the technique described in this study can be adapted for use with any other unit. To those who may be frightened by the largeness of the task, it would have been helpful, however, had the authors stated that while less complete cost studies covering such items as departmental teaching salaries are needed every year, complete cost studies, such as this report exemplifies, are needed only once in several years.

University of Minnesota F. J. KELLY

ANDERSEN, W. N. *A Manual for School Officers.* New York, Century Company, 1925. 183 pp.

Too frequently the inexperienced school administrator discovers, when he faces the responsibility of solving the problems which are forced upon him, that be he ever so well equipped with professional training, it cannot be made to apply directly to the situation which immediately confronts him. Therefore "it is here that he is most in need of direct and practical information that can be applied to the situation at hand."

The author of *A Manual for School Officers* has endeavored to supply such practical information by gathering within the covers of his book a great mass of directly applicable material which has been tried and tested in the field of actual experience. An inspection of its pages reveals such subjects as the superintendent's relation to the board, selecting and employing teachers, the program of studies, problems and principles in program-making, classroom organization, books and supplies, rules and regulations, written examinations and markings, until twenty-five topics have received carefully evaluated treatment.

The book will doubtless prove most serviceable to the superintendent of schools; in fact the author indicates that it is written primarily for him. Its greatest value to the novice lies in its specificity of recommendations. With the volume at hand he need not hesitate to act when confronted by urgent administrative situations. The veteran school man, also, will find valuable suggestions in its pages.

Ohio State University HARLAN C. KOCH

Publications Received, February 15 to March 15

Aeschylus. *The Eumenides.* Trans. by Gilbert Murray. New York, Oxford Univ. Press, 1925. 80 pp. $.90.

Alcott, L. M. *Little women; or, Meg, Jo, Beth, and Amy.* Philadelphia, Winston, 1926. 496 pp. $.80.

Amiel, H. F. *Principes généraux de pédagogie.* Ed. by Léon Bopp. Paris, Librairie Félix Alcan, 1925. 134 pp. 10 fr.

Ashton, M. P. *Story-book tales.* Chicago, Beckley-Cardy, 1926. 112 pp. $.70.

Bogert, L. J. *Fundamentals of chemistry.* Philadelphia, Saunders, 1924. 324 pp. $2.75.

Bopp, Léon. *H. F. Amiel, essai sur sa pensée et son caractère d'après des documents inédits.* Paris, Librairie Félix Alcan, 1926. 373 pp. 30 fr.

Boyd, M. F. *Preventive medicine.* 2d ed. rev. Philadelphia, Saunders, 1925. 429 pp. $4.00.

Breslich, E. R. *Junior mathematics.* New York, Macmillan, 1926. Book 3. 254 pp. $1.00.

Bryant, Laura. *Studies and songs for individual sight-singing.* New York, American Bk. Co., 1926. Book 1. 64 pp. Book 2. 64 pp.

Buckingham, B. R. *Research for teachers.* New York, Silver, Burdett, 1926. 386 pp. $2.20.

Burton-Opitz, Russell. *Elementary manual of physiology.* 2d ed. rev. Philadelphia, Saunders, 1925. 413 pp. $2.50.

Carreon, M. L. *Philippine studies in mental measurement.* Yonkers-on-Hudson, N. Y., World Bk. Co., 1926. 175 pp. $1.80

Clarke, F. E. ed. *Lessons for teaching humane education in elementary schools; composition.* New York, Amer. Soc. for the Prevention of Cruelty to Animals, 1926. 44 pp. $.25.

Counts, G. S. *The senior high-school curriculum.* Chicago, Univ. of Chicago, 1926. 160 pp. (Supplementary educational monographs, no. 29) $1.00.

Daily, B. W. *The ability of high-school pupils to select essential data in solving problems.* New York, Teachers College, Columbia Univ., 1925. 103 pp. (Contributions to education, no. 190) Cloth, $1.50. Paper, $1.25.

Dye, W. S. *Expository writing.* Richmond, Va., Johnson Pub. Co., 1926. 372 pp. $1.60.

Edgerton, A. H. *Vocational guidance and counseling, including reports on preparation of school counselors.* New York, Macmillan, 1926. 213 pp. $1.60.

Findlay, J. J. *The foundations of education; a survey of principles and projects.* New York, Holt, 1925. 345 pp. $2.50.

Foresman, Robert. *Fifth book of songs.* New York, American Bk. Co., 1926. 256 pp. $.88.

France, Anatole. *Riquet.* Ed. by V. F. Boyson. London, Oxford Univ. Press, 1925. 94 pp. $.50.

Heller, M. L. *New standard letterer and show card writer.* Chicago, Laird & Lee, 1926. 168 pp. $3.00.

Goldstein, Mabel. *Child dramatization.* Cleveland, Ohio, Harter School Supply Co., 1925. Per set, $.40.

Harter's perception cards for primary grades. Cleveland, Ohio, Harter School Supply Co., 1925. Per set, $.60.

Heath, J. F. *The hygienic pig and other stories.* Chicago, Beckley-Cardy, 1925. 112 pp. $.70.

Heck, A. O. *A study of child-accounting records.* Columbus, Ohio, Ohio State Univ., 1925. 245 pp. (Bureau of educational research monographs, no. 2) $1.50.

Howe, F. W. *Farm economics.* New York, American Bk. Co., 1926. 221 pp. $1.20.

Inskeep, A. D. *Teaching dull and retarded children.* New York, Macmillan, 1926. 455 pp. $2.00.

Josefita, Sister Maria. *The status of religious instruction for children under sixteen years of age with special reference to Pennsylvania.* Philadelphia, Univ. of Pennsylvania, 1925. 155 pp.

Judd, C. H. *The psychology of social institutions.* New York, Macmillan, 1926. 346 pp. $2.00.

Kirkpatrick, M. G. *Teaching: a business, practical suggestions as to school management.* Boston, Little Brown, 1925. 202 pp. $1.40.

Knight, F. B., and others. *Standard service arithmetics.* Chicago, Scott, Foresman, 1926. Book 2. 547 pp. $.96.

McCarty, S. A. ed. *Children's drawing; a study of interests and abilities.* Baltimore, Williams & Wilkins, 1924. 164 pp. $3.00.

McKinsey, J. O. *Bookkeeping and accounting.* 2d ed. Cincinnati, Ohio, South-Western Pub. Co., 1926. 416 pp.

Moeller, H. C., and Tormey, T. J. *The first days at school.* Boston, Ginn, 1926. 74 pp. $.60.

Morrison, H. C. *The practice of teaching in the secondary school.* Chicago, Univ. of Chicago Press, 1926. 661 pp. $4.00.

My life work. Milwaukee, Milwaukee Vocational School, 1926. Department store occupations. The hosiery industry. The shoe industry. Office occupations series. No. 1, The office boy. No. 2, Office clerical workers. No. 3, The accounting occupations. No. 4, The office machine operators. No. 5, The secretarial worker. Building trade series. No. 6, The sheet-metal worker. No. 8, The steamfitter. No. 9, The structural iron worker. $.15 each.

Mosher, R. M. *A study of the group method of measurement of sight-singing.* New York, Teachers College, Columbia Univ., 1925. 75 pp. (Contributions to education, no. 194) Cloth, $1.50. Paper, $1.25.

Moyer, J. A., and Westrel, J. F. *Practical radio, including the testing of radio receiving sets.* New York, McGraw-Hill Bk. Co., 1926. 271 pp. $1.75.

Newcomb, R. S. *Modern methods of teaching arithmetic.* Boston, Houghton Mifflin, 1926. 353 pp. $2.00.

Nyberg, J. A. *Second course in algebra.* New York, American Bk. Co., 1926. 288 pp. $1.24.

Palmer, C. I., and others. *Solid geometry.* Rev. ed. Chicago, Scott, Foresman, 1925. 521 pp. $1.20.

Parry, Jessie. *Hunt and find, a book of silent reading.* Chicago, Beckley-Cardy, 1925. 48 pp. $.30.

Payne, A. F. *Methods of teaching industrial subjects.* New York, McGraw-Hill Bk. Co., 1926. 293 pp. $3.00.

Pennsylvania school journal; special new school buildings number. Harrisburg, Pa., Pennsylvania State Education Assn., 1925. 176 pp. $1.00.

Pieper, C. J., and Beauchamp, W. L. *Everyday problems in science.* Chicago, Scott, Foresman, 1925. 600 pp. $1.60.

Richey, E. C. *Stories of animal village.* Chicago, Beckley-Cardy, 1926. 139 pp. $.70.

Ruch, G. M., Knight, F. B., and Studebaker, J. W. *Arithmetic work-book.* Ed. by G. W. Myers. Chicago, Scott, Foresman, 1925. Grades IV-VI. Pupils' edition, $.36. Teachers' edition, $.48.

Schorling, Raleigh. *A tentative list of objectives in the teaching of junior high school mathematics with investigations for the determining of their validity.* Ann Arbor, Mich., George Wahr, 1925. 137 pp. $1.20.

Smedley, E. A., and Olsen, M. C. *The first reader.* Chicago, Hall & McCreary, 1925. 192 pp. $.64.

Stevenson, P. R. *Class-size in the elementary school.* Columbus, Ohio, Ohio State Univ., 1925. 35 pp. (Bureau of educational research monographs, no. 3) $.50.

Strayer, G. D., and others. *Problems in educational administration.* New York, Teachers College, Columbia Univ., 1925. 755 pp. $6.00.

Suhrie, A. L., and Gee, M. G. *Story-fun, second year.* New York, Hinds, Hayden & Eldredge, 1926. 174 pp.

Watt, H. A., and Munn, J. B. *Ideas and forms in English and American literature.* Chicago, Scott, Foresman, 1925. 1201 pp. $4.00.

Whitbeck, R. H. *Economic geography of South America.* New York, McGraw-Hill Bk. Co., 1926. 430 pp. $3.50.

Williamson, J. A. *Builders of the empire.* New York, Oxford Univ. Press, 1925. 297 pp. $1.50.

Zoethout, W. D. *A textbook of physiology.* 2d ed. St. Louis, C. V. Mosby Co., 1925. 616 pp. $4.50.

News Items and Communications

This department will contain news items regarding research workers and their activities. It will also serve as a clearing house for more formal communications on similar topics, preferably of not more than five hundred words. These communications will be printed over the signatures of the authors. Address all correspondence concerning this department to Doctor E. J. Ashbaugh, Ohio State University, Columbus, Ohio.

The Division of Education Commonwealth Fund, for the current year awarded twenty fellowships to British graduate students for study in American universities.

How many have had this experience which is quoted from a Bulletin of a Department of Measurement and Research? "The Dearborn Primary Intelligence Scale was given in grades one and two during September for purposes of grouping," but "one teacher just knew that the children couldn't remember five things to do if given all at once so she had them do one at a time."

Mr. A. R. Keppel, principal of the high school at Marietta, Ohio, has recently revised his six-year high-school cumulative record system. As it now stands it provides a complete record of an individual for six years, showing attendance, character, discipline, scholarship, health, and educational- and mental-test scores. The card is designed for a regular 8½" x 11" file with the six cards stapled together and indexed in a convenient manner.

George S. Counts, professor of education at Yale University, will become a member of the faculty of the University of Chicago on July 1. He will devote himself to advanced work in educational sociology. Professor Counts took his Doctor's degree at the University of Chicago in 1916 and since has held professorships at the University of Delaware, Harris Teachers College, University of Washington, and Yale University. He is now chairman of the committee which is carrying on an investigation in secondary schools in cooperation with the United States Bureau of Education. He has published monographs on arithmetic and secondary-school population and is joint author with the late Professor Chapman of a book entitled *Principles of Education*.

Modifying the Technique of Instruction for Gifted Children, (University of Illinois Bulletin, Bureau of Educational Research Circular, No. 41) is by M. E. Herriott, associate in the Bureau of Educational Research at the University of Illinois. Questions of method, sources of information, factors to be considered, desirable adaptations of technique, and a carefully selected bibliography are discussed within the fifteen pages of this booklet.

University of Illinois Bulletin entitled *Appreciation of Latin* (Number 15, December, 1925) contains sections entitled: "Teaching the Aeneid as Literature," "Some Ancient Remains at Rome," "The Springfield Virgil Exhibit," and "Books of Interest to Teachers of the Classics, Published 1922-24." The section, "Miscellaneous," contains a short play written in Latin by a high-school student, a Latin picture gallery, and a Latin cross-word puzzle.

A study of absence made by the Survey Department of the schools of Highland Park, Michigan, revealed the following causes: contagious diseases, 10.6 percent; other illnesses of pupils, 59.1 percent; illness of other persons, 7.6 percent; truancy, 2.4 percent; poverty, .13 percent; necessity of family other than illness or poverty, 6.1 percent; whim of parent, 5.6 percent; undeterminable, 8.6 percent.

The analysis of the data by grades showed that there was more truancy in the high school than in any other division of the system although truancy caused but a small proportion of the absences.

E. E. Keener, director of the Bureau of Instructional Research, Chicago schools, furnishes us the following data regarding persistence of initial spelling errors. A test of one hundred words was given to 23, 44, and 74 pupils in grades six, seven, and eight, respectively. After a period of five weeks during which the words were taught, the test was repeated, and errors made by each pupil in the two tests compared. Considering all the children of the three grades as a single group, the percent of accuracy on the first test was 69.2 percent and on the second test, 94.8 percent. Thirty-four percent of all the words missed on the two tests were the same, and 79 percent of the words missed on the second test were missed on the first.

Mr. P. S. Barnes of the schools of East Hartford, Connecticut, reports that this year they are using the divided-period form of directed study, a full hour period for all subjects. He also states that they are using and have been for some years a "rolling program."

The regular school day closes at three thirty, but the pupils whose work and deportment are satisfactory are accorded dismissal at three o'clock. Pupils who, for any cause, need help are held for the remaining thirty minutes for individual instruction. "This equalizes the burden for all teachers. We do not have 'the faithful' detained after school for help while the 'less faithful' go as soon as children are dismissed."

The following quotation is taken from a mimeographed bulletin of a Department of Research. The Editor would appreciate comments from other research workers as to their agreement or disagreement with the conclusion reached:

Student A is fourteen years old and in the fifth grade. According to the age-grade table he is three years retarded chronologically. On locating his intelligence rating, we find he has a letter rating of C- or classifies a little below average (I.Q. 85-90). On examining the educational profile, it is found that the educational age is twelve, which is four months older than the city median for the VI-B grade. It is also noticed that the arithmetic age is ten years ten months or about equal to the standard for IV-A grade. It is the opinion of this Department that the student should be promoted to the VI-A grade and given special attention in arithmetic.

"Why Children Succeed"

From the large mass of material presented in his Doctor's dissertation, *Why Children Succeed*, Dr. S. A. Courtis draws certain chief, arresting conclusions which carry the aroma of gunpowder and have a stimulating effect upon the minds of those concerned with the closely allied fields of education and mental endowment. These conclusions are as follows:

"Children succeed in their school work in general accordance with their development or maturity. The level of their development at any age level is fixed by hereditary factors which are measured roughly by the intelligence tests, while the training contributes a small but distinctive amount in addition. These factors account for 90 percent of the changes in children."[1]

"The standard deviation of the changes in the Stanford scores on a retest after an interval of two days was a little under 7 percent of the mean score. This suggests that all the remaining factors which influence a child's score have a combined *general* effect which is not more than 3 percent of the total scores . . . ."[2] Again, "3 percent represents the combined distinctive effect of all other factors such as teaching ability, social status, emotional control, home influence, etc."[3]

School success, it may be explained at this point, is defined as score on the Stanford Achievement Test; maturity, as age in months; intelligence, as score on the National Intelligence Test and the Detroit Army Intelligence Test; and training, as the number of semesters of attendance at school. The material from which the above conclusions are drawn consists of data for 165 boys between the ages of ten and a half and thirteen and a half attending training schools connected with Detroit Teachers' College.

If the achievement level of our pupils is conditioned almost entirely by uncontrollable factors such as age and native intelligence, a small though distinctive additional amount, by the term of years during which the pupils are exposed to educational influences, and an insignificant 3 percent, by all other factors combined, the importance of the results to school administration and to psychology cannot be over-estimated.

In the face of such conclusions there arise at once certain issues regarding the statistical procedure employed in the study. They are of such a character as to throw grave doubt upon the validity of the author's conclusions. The reasoning which leads to these conclusions is as follows: A complex of weighted variables, age, intelligence, and training is found to predict scores on the Stanford Achievement Test with a standard error of estimate of 5.46 score points. This value is approximately 10 percent of the mean score, 56.6, on the Stanford Achievement Test. Accordingly, 100 percent minus 10 percent leaves 90 percent as the distinctive contribution of age, intelligence, and training combined.

Further, the standard deviation of changes in the individual scores on the Stanford Achievement Test administered and repeated after a two-day interval is 3.77. This value is 6.69 percent of the mean score, 56.6. It follows, then, that 6.79 percent of the differences in the Stanford Achievement scores can be

[1] Courtis, S. A. *Why Children Succeed.* Detroit, Friesema Brothers Press, 1925. p. 194.
[2] *Op. cit.*, p. 192.
[3] *Op. cit.*, p. 202.

attributed to the unreliability of the test. Finally since age, intelligence, training, and the unreliability of the tests have been found—by methods described in the monograph—to make combined contributions to school success of approximately 97 percent (90 percent plus 6.79 percent), it follows that all other factors combined make a contribution of not more than 3 percent.

Set down in this fashion, which the reviewer believes summarizes the author's reasoning justly, the underlying assumptions of the study are readily seen to contain fallacies which entirely invalidate the conclusions. The method makes the following untenable assumptions: first, *the relative contributions of different factors to pupil deviations are measures of their contributions to total Stanford Achievement Test score—or school success as it has been defined.* This would be true only if the variabilities of all the factors were equal. But presumably many factors have been more or less fixed for all the children, and these have scarcely affected the *deviations*, though they have made contributions of unknown magnitude to the general achievement level or "school success" of the children. Some of these factors are teachers, textbooks, and school equipment—the heavy artillery of our educational offensive. Yet, according to Dr. Courtis' reasoning, if these things, and a great many other, should all be scrapped, the average achievement level of our human educational product would not be diminished by more than 3 percent. The general effect of all these factors combined, he tells us, "is not more than 3 percent of the total score . . . ." Second, *the relative contributions of distinctive groups of factors to pupil deviations can be evaluated in percent by a comparison of the ratios of their standard errors of estimate to the mean score.*

It may well be argued that even if the percentage contributions of certain measurable factors to total achievement level or educational growth cannot be determined by any means now available, a knowledge of the relative influence of these factors upon pupil deviations from the average would be of immense importance to students of the nature-nurture problem. No matter how far improvements in teaching methods, textbooks, social conditions, and rapport between home and school may raise the average educational level of the generations of pupils to come, differences in the achievement of pupils provided with equal opportunity probably always will persist. These may be attributed to nature. Likewise, differences which are due to nurture probably always will appear among pupils of equal endowment. In such differences the biometrician finds a most fruitful field of investigation. In fairness to the author, let us suppose for the moment that these may have been the differences which he had in mind, though he did not give us to understand so.

The author's treatment of data, however, has not yielded results which can be applied to the nature-nurture problem with precision. It is not clear why standard errors of estimate have been divided by the mean in order to get percentage contributions. But it is clear that if we should go one step further in applying this technique, we should get a result something like the following: the standard error of estimate of score on the Stanford Achievement Test predicted from age, intelligence, and training is 5.46 score points, or only 10 percent of the mean score. Consequently these three factors contribute 90 percent to deviations on the Stanford Achievement Test. Now, the

limit of the standard error of estimate of the Stanford Test predicted from variables whose correlation with it approaches zero cannot possibly be greater than the total standard deviation of the test. The total standard deviation for the children tested by Dr. Courtis is 13.24, or only 24 percent of the mean score. Accordingly, all the factors entering into this prediction contribute not less than 100 percent minus 24 percent, or not less than 76 percent to pupil deviations. Add this to the 90 percent contributed by age, intelligence, and training, and our pupil deviations surpass imagination!

BARBARA STODDARD BURKS

Stanford University

Educational Research Association

DR. M. R. TRABUE, *President*
DR. H. A. GREENE, *Secretary-Treasurer*

Annual Meeting of Educational Research Association

Washington, D. C., February 21-24, 1926

The program of the Educational Research Association held in conjunction with the Department of Superintendence consisted of one half-day session open to members only and three open sessions. The open meeting on Wednesday afternoon, February 24, was held jointly with the Society of College Teachers of Education. Attendance at all open meetings was very encouraging to those in charge of the programs, although the attendance of members at the closed sessions was somewhat discouraging.

At the first meeting of the Association on Monday afternoon, February 22, in the auditorium of the Masonic Temple, 13th Street and New York Avenue, some interesting papers were reported the subject-matter of which covered a wide range. Dr. V. E. Dickson, of the public schools of Berkeley, California, reported an experiment in classroom instruction by radio. He drew conservative conclusions concerning the immediate value of the radio as an instructional device but placed no limitations on its possible future development with properly trained teachers and suitably prepared materials of instruction. Dr. John G. Fowlkes, of the University of Wisconsin, presented a paper entitled "Some Needs and the Possibility for Improved Efficiency in High-School Administration," which dealt chiefly with the inequalities of school costs. A paper full of valuable educational implications by Dr. Arthur I. Gates, Teachers College, Columbia University, was entitled "Theories of Learning Tested by the Achievements of Deaf Children." Of much interest to the musicians and those interested in the measurement of musical ability was the report by Dr. Guy M. Whipple, entitled "Measuring Musicians: A New Method of Analyzing the Style of Eminent Players." In this demonstration Dr. Whipple utilized specially prepared rolls on the Duo-Art piano,

and by the ingenious use of this instrument and the rolls shown by a series of excellent lantern slides he was able to reveal those differences in time and intensity which result in the so-called artistic interpretation of the masters. A paper of practical significance to the school administrator was the study of "Pupil Failures and Subject Failures in the Chicago Public Schools" presented by Dr. Don C. Rogers. The afternoon program was closed by an able discussion of "Intellect of Races: Is There a Nordic Myth?" by Dr. H. O. Rugg of Lincoln School of Teachers College. Dr. Rugg has recently measured under carefully controlled conditions thousands of Philippine and Porto Rican children in comparison with white children. By careful process of eliminating the factor of racial experience, as well as immediate training, he concludes that the theory of white superiority is largely a myth.

The open program of Tuesday afternoon, in the auditorium of the Masonic Temple, was unusually well attended, and those present were rewarded by an excellent program. Dr. F. P. Obrien, of the University of Kansas, reported on "Intelligence Ratings and Later Progress in High School and College." Dr. S. A. Courtis of the University of Michigan and the Detroit public schools showed by a series of excellent lantern slides the function of certain social features upon success in school. Dr. Ernest Horn, of the State University of Iowa, tentatively answered the question "How Many Words Should Pupils Be Taught to Spell?" by raising many other questions related to the problem. The basis of this report was the research which he has been conducting for many years on the analysis of vocabularies. From his data on the "Results of Homogeneous Classification of Junior High-School Pupils," E. E. Keener of the Chicago public schools drew the conclusion that the results of homogeneous classification were entirely satisfactory to those in charge of the experiment. Dr. W. J. Osburn, of the Wisconsin State Department of Public Instruction, reported certain of his recent investigations in examination questions in history. Superintendent Carleton W. Washburne, of Winnetka, Illinois, presented "A Scientifically Graded Book List for Children."

The third of the open programs was held in Corcoran Hall of the George Washington University in conjunction with the Society of the College Teachers of Education. The list of the papers presented at that time follows:

"Limitations of the Social Principle in Making a Curriculum," F. S. BREED, *University of Chicago*

"Investigations of Tests and Examinations in the Social Studies," G. M. RUCH, *State University of Iowa*

"Training Teachers to Utilize Community Resources as Curriculum Materials," E. D. GRIZZELL, *University of Pennsylvania*

"A Transplanted American Educational Administration, the Philippine School System," CARTER ALEXANDER, *Teachers College, Columbia University*

"Job Analysis and the Problem Attack in the Training of Superintendents of Schools," GEORGE D. STRAYER, *Teachers College, Columbia University*

"The Evaluation of Two Methods of the Teaching of Spelling," CLIFFORD WOODY, *University of Michigan*

"A Study of the Causes of Elimination in a College of Liberal Arts for Women," AGNES L. ROGERS, *Bryn Mawr College*

"The Whole versus Part Methods in Learning," L. A. PECHSTEIN, *University of Cincinnati*

The closed sessions of the Association were held in Corcoran Hall of George Washington University, Tuesday morning, February 23. The programs were called at 9:15, but due to the failure of members of the Association to arrive promptly the meetings were considerably delayed in beginning. The original plan called for three round-table sessions with programs in progress at the same time. Program A as outlined dealt with research techniques; Program B, with fields of English and reading; and Program C, with supervisory problems. The members in attendance finally divided themselves into two sections, and Programs A and B of the round tables were carried through as planned. Program A which dealt with research activities was in charge of Dr. C. W. Odell, of the University of Illinois. The following papers were presented before this section and discussed:

"The Relative Accuracy of Group Intelligence-Test Quotients," FOWLER D. BROOKS, *Johns Hopkins University*
"Effect of Chronological Age on High Intelligence Quotients of Elementary-School Pupils," MARGARET V. COBB, *New York City*
"A Method of Computing Accomplishment Quotients on the High-School and College Level," CHARLES C. PETERS, *Ohio Wesleyan University*
"A Job Analysis of Multiple Correlation," R. L. MORTON, *Ohio University*
"Measurement of Non-Academic Traits in an Experimental Third-Grade Class," KATHARINE MURDOCH, *New York City*
"Reduction of Experimental Groups by Means of Correction Formulae," S. A. COURTIS, *University of Michigan*

At this point in this program Fletcher H. Swift, University of California, who was to have appeared on Program C, presented his paper "Progressive Tendencies in Apportioning State School Funds."

In Program B which was in charge of Dr. F. P. Obrien, University of Kansas, the following papers were presented:

"The Spoken Vocabulary of Children below Seven Years of Age," ERNEST HORN, *University of Iowa*
"An Experiment in Vocabulary Building in High-School Pupils," PERCIVAL M. SYMONDS, *Teachers College, Columbia University*
"The Vocabularies of High-School Science Textbooks," SAMUEL R. POWERS, *Teachers College, Columbia University*
"Objectively Measurable Factors Determining Grade-Placement of Content Material in Reading," CARLETON W. WASHBURNE, Public Schools Winnetka, Illinois
"Practice Effect in Charters' Diagnostic Language Test and the Kirby Grammar Test," J. CAYCE MORRISON, *Ohio State University*
"The Validity of Certain English Tests," M. H. WILLING, *Lincoln School of Teachers College*
"Analysis of Errors in Certain Aspects of the Written English Work of Public-School Pupils," S. L. PRESSEY, *Ohio State University*

In keeping with plans discussed at the annual business meeting of last year, the annual banquet and business meeting was held early in the week of the convention, Monday evening, February 22 at Hotel Lafayette. The popularity of the idea of holding the banquet early in the week was proved by the fact that eighty-one members and guests were seated at the banquet table. Arrangements made by M. R. Trabue, president of the Association, permitted the members of the Association to enjoy President Coolidge's speech to the

general session of the Department of Superintendence without leaving the banquet room. In keeping with the custom of the Association, President Trabue presented at the close of the meeting his résumé of the outstanding educational research reported in the year 1925; though he condensed his material greatly on account of the late hour, he gave an able review of a surprising amount of educational research material.

At the business meeting of the Executive Committee held Sunday, February 21, the president appointed a Nominating Committee consisting of Dr. B. R. Buckingham, N. W. Anderson, and Dr. Virgil Dickson, and an Auditing Committee consisting of Dr. W. W. Theisen and Dr. G. M. Ruch. Later the Auditing Committee audited and approved the accounts of the treasurer, and the Executive Committee completed action on the petitions of the following people: Edward Earle Franklin, Detroit Teachers College, Philip A. Boyer, Philadelphia, Homer Davis, Chicago. On nomination from within the committee the names of the following persons contributing largely to the field of educational research were approved for membership: Frank L. Clapp, University of Wisconsin, Paul W. Terry, University of North Carolina, Willis L. Uhl, University of Wisconsin, Ward G. Reeder, Ohio State University, Samuel S. Brooks, Ohio State University, Worth McClure, Seattle Public Schools, Josephine MacLatchy, Ohio State University, Karl Holzinger, University of Chicago.

In a brief business session at the annual dinner at Hotel Lafayette, a resolution was passed providing for the financial cooperation of the Educational Research Association in the work of the National Committee on Research in Secondary Education to the extent of $50.00. Dr. Ashbaugh, who had been previously appointed by the chairman to represent the organization at a meeting of this committee, reported on the activities of the committee and its plans for the future.

In an adjourned meeting held in Room 24, Corcoran Hall, George Washington University, Tuesday, February 23, Dr. Rugg presented the matter of the publication of an Association yearbook. A resolution providing for the appointment of a committee of investigation as to the feasibility of undertaking the publication of such a yearbook and the outlining of a series of such yearbooks for the future was passed. A committee was not appointed at this meeting.

The Committee on Nominations in its report named the following officers who were unanimously elected by the Association:

President—W. J. Osburn
Vice-President—P. R. Stevenson
Secretary-Treasurer—Laura Zirbes

Secretary's Report

March 1, 1925 to March 1, 1926

Honorary members	12
Members in good standing	151
Members of 1925 lost	
By resignation	1
E. E. McMillan	

By death 2
J. Crosby Chapman — O. J. Johnson
By non-payment of dues, 1926..... 4
Helen Davis — W. W. Phelan
J. P. Herring — T. L. Torgerson
Total..... 7

Members gained since last report
New members:
Margaret Alltucker — C. E. Greene
L. C. Bain — G. R. Johnson
H. F. Clark — J. R. McGaughey
W. L. Connor — Don C. Rogers
S. C. Garrison — H. L. Smith
Total..... 11
Reinstatement of old members..... 1
Helen Davis

FINANCIAL STATEMENT MARCH 1, 1925 TO FEB. 15, 1926

RECEIPTS

Cash on hand (March 1, 1925)			$497.50
Membership dues	$639.00		
Exchange	.10		
Banquet tickets (4)			
3 checks—$2.85			
1 check — 2.75	11.30		
		$650.40	
Total cash			$1,147.90

EXPENDITURES

Executive Committee			
President's office (No bills presented at time of report)			
Secretary-treasurer's office			
Printing and stationery	$ 5.35		
Postage	14.00		
Stenographic help	13.00		
Exchange on checks	3.51		
Telegrams	.72		
		$36.58	
Miscellaneous			
Rental of stereopticon (By E. J. Ashbaugh)	$10.00	$10.00	
Public School Publishing Co	$400.00	$400.00	
			$446.58
Cash on hand			$701.32
Total			$1,147.90

HARRY A. GREENE, *Secretary*

University of Iowa

PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

1928

Journal of Educational Research

OFFICIAL ORGAN OF THE
EDUCATIONAL RESEARCH ASSOCIATION

B. R. BUCKINGHAM, EDITOR

ASSOCIATE EDITORS

E. J. ASHBAUGH — W. W. CHARTERS — GEORGE D. STRAYER
GUY M. WHIPPLE — S. A. COURTIS — LEWIS M. TERMAN
HARRY A. GREENE

VOL. XIII — MAY 1926 — No. 5

CONTENTS

	Page
THE INFLUENCE OF CERTAIN SOCIAL FACTORS UPON SCORES IN THE STANFORD ACHIEVEMENT TESTS — S. A. Courtis	311
THE SOURCES OF SPENCER'S EDUCATION — H. G. Good	325
EDUCATIONAL RESEARCH IN 1925 — M. R. Trabue	336
THE COUNTY SUPERINTENDENT OF SCHOOLS AS SUPERVISOR OF INSTRUCTION — F. P. O'Brien	345
COMPARATIVE EFFECTIVENESS OF THE LECTURE-DEMONSTRATION AND INDIVIDUAL LABORATORY METHOD — Fred G. Anibel	355
TRAINING RESEARCH WORKERS — C. C. Crawford	366
EDITORIALS	371
REVIEWS AND ABSTRACTS	374
NEWS ITEMS AND COMMUNICATIONS	380
EDUCATIONAL RESEARCH ASSOCIATION	384

Entered as second-class matter at the Post Office at Bloomington, Illinois under the act of March 3, 1879.

Journal of Educational Research

Copyright 1924, by
Public School Publishing Co.

Official Organ of the Educational Research Association

Editor-in-Chief, B. R. Buckingham
Director of Bureau of Educational Research, Ohio State University, Columbus, Ohio

Associate Editors

S. J. ASHBAUGH, *Ohio State University, Columbus.*

W. W. CHARTERS, *University of Pittsburgh, Pittsburgh.*

S. A. COURTIS, *City Schools, Detroit, Mich.*

HARRY A. GREENE, *Ex-Officio, Secretary Educational Research Association, State University of Iowa, Iowa City.*

GEORGE D. STRAYER, *Teachers College, Columbia University, New York City.*

LEWIS M. TERMAN, *Leland Stanford Junior University, Stanford University, California.*

GUY M. WHIPPLE, *Secretary National Society for the Study of Education, 10 Putnam St. Danvers, Mass.*

Contributing Editors

MURRAY DALMAN, *Director Department of References and Research, Indianapolis, Indiana.*

VIRGIL E. DICKSON, *University of California and Berkeley Public Schools.*

CHARLES FORDYCE, *Director of Bureau of Educational Measurements, University of Nebraska.*

WILLIAM S. GRAY, *Dean, School of Education, University of Chicago.*

M. E. HAGGERTY, *Dean of the College of Education, University of Minnesota.*

V. A. C. HENMON, *Director, School of Education, University of Wisconsin.*

ERNEST HORN, *University of Iowa.*

ARTHUR W. KALLOM, *Assistant Director, Department of Educational Investigation and Measurement, Public Schools, Boston, Mass.*

F. J. KELLY, *Dean Administration, University of Minnesota.*

ROBT. H. LANE, *Assistant Superintendent of Schools Los Angeles, Cal.*

WILLIAM A. McCALL, *Associate Professor of Education, Teachers' College, Columbia University.*

GEORGE W. MELCHER, *Director, Bureau of Research and Efficiency, Public Schools, Kansas City, Mo.*

ARTHUR B. MOEHLMAN, *University of Michigan and Detroit Public Schools, Ann Arbor, Mich.*

EUGENE A. NIFENECKER, *Assistant Director, Bureau of References, Research and Statistics, Public Schools, New York City.*

JOSEPH P. O'HERN, *Assistant Superintendent of Schools, Rochester, N. Y.*

W. J. OSBURN, *Director Educational Measurements, State Department of Public Instruction, Madison, Wis.*

J. B SEARS, *Stanford University, Stanford University, Cal.*

J. L. STENQUIST, *Director Bureau of Educational Research, Public Schools, Baltimore, Md.*

W. W. THEISEN, *Assistant Superintendent of Schools Milwaukee, Wis.*

C. W. WASHBURNE, *Superintendent of Schools, Winnetka, Ill.*

CLIFFORD WOODY, *Director Bureau of Tests and Measurements, University of Michigan.*

The JOURNAL OF EDUCATIONAL RESEARCH is published at Bloomington, Illinois, monthly, except July and August by the Public School Publishing Co. The subscription price is $4.00; $4.10 in Canada or Mexico; and $4.50 in other foreign countries.

The editorial office is at Columbus, Ohio. Address all communications on editorial matters to B. R. Buckingham, Director of Bureau of Educational Research, The Ohio State University, Columbus, Ohio.

Subscriptions and all communications about reprints or other business matters should be addressed to the Public School Publishing Company at Bloomington, Illinois.

JUST PUBLISHED

BROWN-WOODY CIVICS TEST

BY ARNOLD W. BROWN

Formerly Assistant in Educational Psychology
University of Michigan

AND CLIFFORD WOODY

Professor of Education and
Director of Educational Reference and Research
University of Michigan

This test for the objective measurement of achievement of students in civics may be used with senior high school students or with students in junior high school or elementary school who have completed a course in community civics.

There are three parts to the test covering civic vocabulary, civic information, and civic thinking. The exercises of the test deal with information, habits, thinking, ideals, attitudes, and appreciation. It is essentially a diagnostic test.

The material of the test was chosen with greatest care and is founded upon the subject matter common to at least five of nine of the most widely used textbooks in civics. Local, state, and national government are covered.

Experimental work on the test occupied a year and a half and, on the basis of use of a preliminary edition with 2,000 students in junior or senior high school, it was revised. In its present form, percentile norms and medians are presented for senior high school civics and for ninth grade community civics.

Use of this test should enable the teacher to determine the pupil's ability in civics and consequently to meet the needs of the pupil with the most effective and efficient instruction.

Examination: Form A. Price per package of 25 examination booklets, with Manual of Directions, Key, and Class Record, $1.30 net.

Specimen Set. An envelope containing 1 Examination and 1 Key, 1 Manual of Directions, and 1 Class Record. Price 15 cents postpaid.

WORLD BOOK COMPANY

Yonkers-on-Hudson, New York **2126 Prairie Avenue, Chicago**

National Education Handbook Series

Handbook of Suggestions and Course of Study for Subnormal Children

By MOSSIE D. HOLMES
Supervisor, and Special Class Teachers, in Collaboration

Introduction by HENRIETTA V. RACE, Ph. D.
Director, Bureau of Educational and Psychological Research, Youngstown Public Schools
Youngstown, Ohio

This is an opportune book. It comes just as many of the states are passing laws and making appropriations for the education of handicapped children.

The plan of procedure has been four years in the making and is the work of teachers and supervisor in an unprejudiced attitude, studying the abilities of five hundred subnormal children, trying out a proposed course, revising, cutting and adding to, as these children were able to accomplish the work, so that it is built on actual accomplishment of subnormal children. The plan is that of the project.

The book contains provision for classification, daily programs, special reports to parents, plans for academic work suitable for subnormal children, methods of teaching, lists of suitable textbooks and supplementary books, lists of helpful books for teachers, studies in projects, plans for health education, citizenship training, and INDUSTRIAL ARTS, such as basketry, raffia work, weaving, paper construction, carpentry, cooking, sewing, laundry work, etc., with detailed instructions for making many valuable articles. Carefully worked out practical lists of equipment, such as tools and working materials, are given.

PRICE $1.50

NATIONAL PUBLISHING SOCIETY
Mountain Lake Park, Maryland

CIVIC SCIENCE

THE HUNTER AND WHITMAN SERIES

By GEORGE W. HUNTER, Ph. D., Professor of Biology, Knox College, Galesburg, Ill. and WALTER G. WHITMAN, A. M. Physical Science Department, State Normal School, Salem, Mass.

CIVIC SCIENCE IN THE HOME 416 pp. Ill. $1.40
CIVIC SCIENCE IN THE COMMUNITY 430 pp. Ill. $1.40
CIVIC SCIENCE IN HOME AND COMMUNITY 527 pp. Ill. $1.60

These books on elementary science present important facts relating to air, water, food, wastes, sanitation, germ dangers, and health habits; heating of homes, fire prevention, care of eyes, electricity and labor saving machines; recreation, effect of climate, transportation, automobile, airplane, telephone, telegraph, radio, etc.

New York
Cincinnati
Chicago
Boston
Atlanta

AMERICAN BOOK COMPANY
330 East 22d Street
CHICAGO, ILL.

Why We Advertise In this Magazine

THE NUMBER OF ANSWERS TO A MAGAZINE ADVERTISEMENT DEPENDS ON THE CONFIDENCE FELT IN THE MAGAZINE BY ITS READERS

Our prompt attention to mail orders for teachers' professional books and testing material is a source of pride to us and of convenience to you.

PUBLIC SCHOOL PUBLISHING CO.
BLOOMINGTON, ILL.

Harvard University
SUMMER SCHOOL OF ARTS AND SCIENCES AND OF EDUCATION

July 6—August 14, 1926

Courses in Educational Measurement

SB2. Principles of Mental Testing (theoretical course). Professor Frank N. Freeman, University of Chicago.

SB3. Measurement of Intelligence (training course). Assistant Professor Edwin A. Shaw, Harvard University.

SB9. Experimental Education (laboratory course). Professor Freeman.

SG1. Tests and Measures in School Subjects. Assistant Professor Shaw.

SG2. Educational Measurement (laboratory course). Assistant Professor Edward A. Lincoln, Harvard University.

For information concerning these courses and other courses in Education and related subjects, address the

Secretary of the Summer School
Harvard University
Cambridge, Massachusetts

THIS MAY—OR MAY NOT BE A POEM

Alfred O. Brown

Spring poets seldom have much luck
In getting space from my friend, Buck-
Ingham, unless like me they pay
For space on which to rhyme their say.
Since I bought but a scant half page
I can't waste more in persiflage
But must proceed at once to sing,
To make the very welkin ring,
In praise of books that it were well
For you to buy and me to sell.

Guy Whipple's *Problem Series*, then,
Has grown in numbers up to ten.
Ward Reeder brings a beam of light
To those who would learn *How to Write*
A Thesis, while for those who build
Curricula, a worthy guild,
Roy Johnson's study's worth a look;
English Expression is his book.
And, as for the Winnetka plan,
Ask Carleton Washburne, he's the man.

PUBLIC SCHOOL PUBLISHING COMPANY
BLOOMINGTON, ILLINOIS

FIVE NEW BOOKS FROM MACMILLAN ON TIMELY PHASES OF EDUCATION

Psychoanalysis

MORTON: Childhood's Fears

"An exceedingly accurate and unprejudiced survey—a masterly little book."
Methodist Times (London) $1.80

Educational Method

INSKEEP: Teaching Dull and Retarded Children

"Supplies a definite help and guidance to teachers in the interest of the better education of all handicapped children"
From the Introduction by H. B. Wilson. $2.00

Child Study

WOOLEY: An Experimental Study of Children

An investigation into the mental and physical differences between working children and school children from ages 14-18. $4.00

Speech Improvement

PEPPARD: The Correction of Speech Defects

"Clear, vigorous, soundly based, thoroughly informed, and entirely practical."
N. Y. Times Book Review. $1.40

Adolescence

RICHMOND: The Adolescent Girl

"Sound, scientific, and realistic advice." "A frank and wholesome book—of inestimable value."
Journal of Education. $1.25

THE MACMILLAN COMPANY

New York Boston Chicago Atlanta Dallas San Francisco